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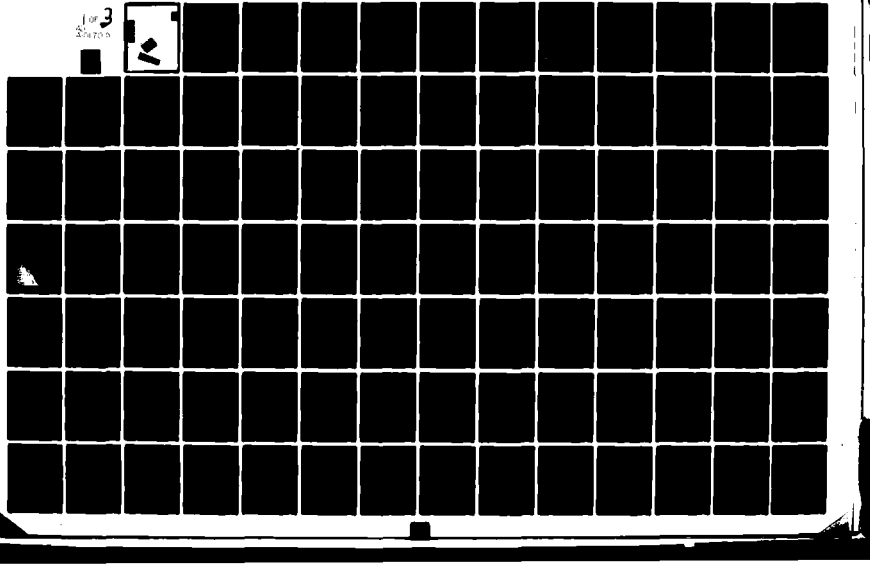

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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*
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Cazenovia Creek
Flood Management

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*
The Draft Environmental Statement (EIS) on Water Resources Development in the Cazenovia Creek basin has been prepared by the Buffalo District, Corps of Engineers consonant in accordance with the National Environmental Policy Act of 1969 (NEPA), Public Law 91-190. Two primary objectives are sought in the development of this document. First, in carrying out the processes and studies involved in preparing a suitable EIS, an agency is required to carefully identify and evaluate the effects of a proposed project on the total human environment. The EIS is in fact, a detailed chronological documention of

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these processes and studies. Secondly, the EIS provides for broad Federal, State and public reveiw of the details of the proposed project and the impacts, both favorable and unfavorable, which the project will have on the existing environment. Regulations provide that a 45-day reveiw period will follow issuance of a draft EIS, during which time any interested agency, organization or party may submit comments in writing to the issuing agency on the proposed project or the draft EIS. The issuing agency is then required to specifically address each comment and issue a final EIS, which after its approval is submitted to the President's Council on Environmental Quality (CEQ). It then becomes an instrument, organic to the planning process, which delineates environmental benefits and costs much as the project survey reprot delineates economic benefits and costs, Therefore, it is imperative that the preparing agency put forth a maximum effort in developing an accurate, complete and objective EIS and that reviewing bodies submit cogent and relevant comments.

Buffalo Metropolitan Area, New York.
Water Resources Management. Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed.

SUMMARY
FEASIBILITY STUDY FOR FLOOD CONTROL
AND RELATED PURPOSES
CAZENOVIA CREEK, ERIE COUNTY, NEW YORK

( ) Revised Draft Environmental Statement (X) Final Environmental Statement

Responsible Office: U. S. Army Engineer District, 1776 Niagara Street, Buffalo, New York 14207 PH# A.C. 716-876-5454

1. Name of Action: ( ) Administrative (X) Legislative

2. Description of Action: Both structural and non-structural features are proposed in the feasibility study for flood control and related purposes on Cazenovia Creek. Non-structural measures include flood plain management and participation in the National Flood Insurance Program. Such measures are recommended for Reaches 1 through 3, areas along the main stem of Cazenovia Creek between the ice retention structure and confluence of east and west branches, Tannery Brook, and the east and west branches of Cazenovia Creek.

The structural flood protection measure would include an ice retention structure in West Seneca to reduce ice-affected flood stages in the following reaches: Reach 1, Buffalo River to the New York State Thruway; Reach 2, New York State Thruway to the Ridge Road Bridge; Reach 3, Ridge Road Bridge to upstream of Mill Road. The ice retention dam structure would be constructed approximately one mile upstream of Union Road and would consist of a concrete dam and spillway forming an 11-acre pool with a maximum depth of approximately 10 feet. The structure would rest on bedrock and the ends of the dam would be tied into high ground by means of wingwall abutments with top elevation about 30 feet above the creek bed level. A floating ice boom would be anchored in several places upstream of the dam to obstruct downstream movement of ice during periods of thaw or high flow. The pool would serve to pond water flowing into it, thereby promoting formation of an ice cover during the winter to prevent ice flows from moving downstream into Reaches 1, 2, and 3 during ice breakup periods. Three gated 36-inch diameter conduits would be placed at the bottom of the spillway to permit drainage of the pool during that period of the year that the ice retention structure is needed.

3. a. Environmental Impacts: Flood plain management provisions of the project would serve to help perpetuate the natural state of Cazenovia Creek and the primary floodway, and would provide a means of controlling flood plain encroachment. Non-structural flood control measures would contribute toward lessening the potential impact of future flooding.

The proposed ice retaining structure would reduce the potential threat of flooding in Reaches 1 through 3 in Buffalo and West Seneca. Based

on October 1972 levels of development and October 1974 price levels, the ice retention structure would reduce average annual damages along Cazenovia Creek from $228,700 to $75,300. There would be very little flood damage reduction in Subreach 1A. Installation of the proposed ice retaining structure would: a. reduce the one percent probability flood stages in Subreaches 1B and 2A by approximately three feet; b. not significantly decrease flood levels and average annual damages in Subreach 2B; c. reduce flood levels somewhat in Subreach 3A; d. reduce flood stages over five feet for a one percent probability flood discharge in Subreach 3B; e. reduce the chance of water level reaching the Southgate Plaza parking area in Subreach 3C, or the houses upstream of Union Road, from 40 percent to four percent on an annual basis.

The birthplace of Millard Fillmore, 13th president of the United States (1850-53), is located in East Aurora. This site has recently been included in the National Register of Historic Places. No other National Register properties or Historic Landmark sites either included or eligible for inclusion in the National Register are known to exist in the Cazenovia basin. To verify this observation, comments have been requested from the New York State Office of Parks and Recreation and the U. S. Department of the Interior. Letters requesting comments from these agencies are included in Appendix B, entitled "Letters of Coordination".

Although the proposed plan involves pool draining for long periods of time annually, should local interests decide to maintain a somewhat lentic pool (slow moving), it is possible that the pool may provide a habitat for aquatic organisms.

It is anticipated that no existing industrial or commercial activity and public service would be disrupted. No homes or farmsteads would require relocation and no existing industrial or commercial activity and public service would be disrupted. Only one man-made structure - an abandoned warehouse - would be relocated. Inundation rights would have to be obtained for about 20 acres of potential agricultural land but there would be no significant loss of tax revenues.

b. Adverse Environmental Impacts: Temporary impacts such as noise, dust and water turbidity would occur during construction. However, the Contractor performing the work would be required to minimize these effects by following procedures and regulations outlined in the Civil Works Construction Guide Specification for Environmental Protection (CE-1300, May 1970).

The following approximate acreage area would be disrupted by construction activity or periodic flooding:

1	acre	--- Dam Site
5	acres	--- Excavated for the stilling pool
20	acres	--- Subject to periodic flooding
10	acres	--- Cleared, grubbed and restored by grading and planting
36	acres	TOTAL

Estimated acreage subject to potential ice scour above the dam includes:

5 acres	--- Excavated for the stilling basin
10 acres	--- Cleared, grubbed and restored by grading and planting
50 acres	--- Additional area east of the dam
65 acres	TOTAL

When flooded, the stilling pool would occupy about 11 acres total - this includes the aforementioned 5 acre area that would be excavated and 6 acres of natural creek channel.

The ice retention structure would have some probable impact upon stream-life and water quality in Cazenovia Creek. Siltation due to construction would cover some benthic organisms downstream and may even disrupt spawning beds. Annual drainage of the ice retention pool would also destroy benthic organisms that have established in the pool sediment. If the pool should stratify and its lower waters stagnate, drainage of the pool may release stagnated water into Cazenovia Creek downstream. However, it is anticipated that the pool would probably stagnate only under relatively extreme conditions as indicated in paragraph 4.11 of this statement.

4. Alternatives: Alternatives to the proposed action are as follows:

Alternative 1 - Local Protection in Reach 3 and Flood Plain Management.
Alternative 2 - Floodproofing in Reach 3 and Flood Plain Management.
Alternative 3 - Ice Retention Structure and Flood Plain Management.
Alternative 4 - No Action.

5. a. Comments Received: (District Review): The following agencies and organizations responded to requests for comments on the Draft Environmental Impact Statement:

U. S. Department of Transportation	10 December 1974
U. S. Department of the Interior:	
(1) Bureau of Outdoor Recreation	9 January 1975
(2) Bureau of Mines	13 January 1975
(3) National Park Service	16 January 1975
(4) Fish and Wildlife Service	7 March 1975
U. S. Department of Agriculture - Soil Conservation Service	6 January 1975
U. S. Environmental Protection Agency - Region II	27 January 1975
New York State Parks and Recreation	10 March 1975
New York State Department of Health	9 December 1974
New York Archaeological Council	6 February 1975
The State Education Department:	
New York State Museum and Science Service	18 February 1975
New York State Department of Environmental Conservation	20 February 1975

b. Comments Received: (Departmental Review): The following agencies responded to requests for comments on the Revised Draft Environmental Statement:

U. S. Department of Housing and Urban Development	14 September 1976
U. S. Environmental Protection Agency	1 October 1976
U. S. Department of Health, Education and Welfare	6 October 1976
U. S. Department of Agriculture - Soil Conservation Service	29 October 1976
U. S. Department of Interior	5 November 1976
U. S. Department of Transportation	11 November 1976
N. Y. S. Department of Environmental Conservation	13 January 1977

6. Draft Statement to CEQ 3 December 1974.

Revised Draft Statement to CEQ 20 August 1976.

Final Statement to CEQ _____.

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INTRODUCTION

The Draft Environmental Statement (EIS) on Water Resource Development in the Cazenovia Creek basin has been prepared by the Buffalo District, Corps of Engineers consonant in accordance with the National Environmental Policy Act of 1969 (NEPA), Public Law 91-190. Two primary objectives are sought in the development of this document. First, in carrying out the processes and studies involved in preparing a suitable EIS, an agency is required to carefully identify and evaluate the effects of a proposed project on the total human environment. The EIS is, in fact, a detailed chronological documentation of these processes and studies. Secondly, the EIS provides for broad Federal, State and public review of the details of the proposed project and the impacts, both favorable and unfavorabe, which the project will have on the existing environment. Regulations provide that a 45-day review period will follow issuance of a draft EIS, during which time any interested agency, organization or party may submit comments in writing to the issuing agency on the proposed project or the draft EIS. The issuing agency is then required to specifically address each comment and issue a final EIS, which, after its approval, is submitted to the President's Council on Environmental Quality (CEQ). It then becomes an instrument, organic to the planning process, which delineates environmental "benefits" and "costs" much as the project survey report delineates economic benefits and costs. Therefore, it is imperative that the preparing agency put forth a maximum effort in developing an accurate, complete and objective EIS and that reviewing bodies submit cogent and relevant comments.

The draft environmental statement and this revised draft environmental statement contains nine sections. Section 1 is a description of the proposed project. At this point in the project development process, final engineering designs and specifications are not available, thus many specific project features can be described in only general terms. The description is, however, as complete and current as possible.

Section 2 describes in detail the present environmental setting in the project area--not only in the immediate zone of construction, but also in more distant surrounding areas which may be indirectly affected by the proposed project. Section 3 describes the effect of the proposed action on land use plans in the project area.

The information developed in the first three sections sets the stage for an analysis and prediction of the effects of the proposed project superimposed upon the baseline conditions (Section 4). Not all changes will be favorable; nevertheless, should a project not deliver some substantive benefits, its justification would be tenuous. Many adverse effects of most projects can be mitigated or eliminated to an extent by innovative planning or engineering techniques. However, many other impacts are absolute and not subject to such mitigation and, as such, stand as adverse and unavoidable. These impacts are identified in Section 5.

A large number of feasible alternative solutions may exist to any problem. It is the responsibility of a planning agency, such as the Corps of Engineers, to identify and carefully study each possible alternative from an engineering, economic and environmental perspective in order that the most desirable, cost-effective and environmentally sound alternative is selected. Section 6 describes each considered alternative and discusses its costs, feasibility and environmental impacts. Sections 7 and 8 deal with the questions of long-term impacts of the proposed project on productivity, social well-being and commitments of natural resources.

Interagency coordination and public meetings and workshops are held on every Corps project. So that reviewers of the EIS are aware of the depth and extent of the Corps outside involvement in the Cazenovia Creek Project, a summary of these events is outlined in Section 9.

Letters of comment received on the draft environmental statement are included in Appendix A of this revised draft environmental statement; responses to all written comments received follow paragraph 9.09 in Section 9.

SECTION 1

1. PROJECT DESCRIPTION

1.01 This section describes in detail the plan proposed to meet flood management needs in the Cazenovia Creek Basin. The description includes physical features, effects of the plan, and significant design and construction information. Project benefits and costs, given in Appendix C, have been updated to reflect October 1974 price levels. Plate 1 is a map of Cazenovia Creek Basin. Plate 2 delineates damage reaches along Cazenovia Creek. Plates 3 and 4 depict the plan of structural improvements recommended in the proposed plan.

1.02 The feasibility study of Cazenovia Creek was undertaken in response to: resolutions by the Committee on Public Works of the House of Representatives adopted 13 June 1965; resolution by the Committee on Public Works of the United States Senate, adopted 10 July 1961; and resolution of the House Committee on Public Works adopted on 14 June 1972.

1.03 The proposed plan is described in detail below. The key feature of the plan is the construction of an ice retention dam on Cazenovia Creek in West Seneca. No additional structural measures are considered necessary. Note that the degree of protection provided varies throughout the damage reaches. See Section 6 for a discussion of considered flood management alternatives.

1.04 The proposed plan of action is as follows:

Reach	Plan of Action	Degree of Protection
1-Buffalo River to NY State Thruway	Recommend floodplain management and flood insurance. Ice retention structure will provide some benefit by reducing ice-affected flood stages.	1A 30 yr. 1B 55 yr.
2-NY State Thruway to Ridge Road Bridge	Flood insurance and floodplain management recommended in this reach. Ice retention structure will reduce the ice-affected flood stages in Reach 2A, providing some benefit.	2A 10 yr. 2B 2 yr.
3-Ridge Road Bridge to upstream of Mill Road	Ice retention structure will provide substantial benefits by reducing ice-affected flood stages. Floodplain management and participation in flood insurance program recommended in this reach.	3A 60 yr. 3B 125 yr. 3C 25 yr.

Reach	Plan of Action	Degree of Protection
Main stem of Cazenovia Creek between ice retaining structure and confluence of East and West Branches; West Branch; East Branch.	Floodplain Management and flood insurance are recommended.	No protection
Tannery Brook	No structural measure was found to be economically feasible along Tannery Brook. Floodplain management and flood insurance are recommended. Individual homeowners may find it desirable to floodproof their residences.	No protection

1.05 Non-structural Features

1.06 Participation in the National Flood Insurance Program is the recommended non-structural feature of the selected plan. The U. S. Department of Housing and Urban Development (H.U.D.), the administering agency for this program, has issued preliminary maps showing flood hazard areas for every township in the Cazenovia Creek Basin plus the City of Buffalo and the Village of East Aurora, indicating the overall basinwide need for effective floodplain management of all areas bordering the creek and its major tributary, Tannery Brook.

1.07 To participate in the National Flood Insurance Program, a local government must adopt sound floodplain management regulations meeting H.U.D. approval. The procedure generally followed by local governments to qualify for the program is discussed below.

1.08 Generally, a local government is made aware of its need for participation in the program when H.U.D. issues a preliminary map identifying special flood hazard areas. Existing developments within these flood hazard areas are required to have flood insurance before they are able to get financial aid (mortgages, improvement loans, etc.) from Federally insured, regulated, or subsidized institutions. To qualify the area for flood insurance, the local government must apply to H.U.D. for eligibility to the temporary emergency program providing flood insurance to existing developments at subsidized rates. The application must include tentative floodplain management regulations. A Type 15 flood insurance study is then conducted by the Corps of Engineers or other qualified agency using detailed hydrologic and hydraulic studies to determine the 100-year floodplain and to zone the area according to the relative flooding risk. The results are submitted to H.U.D. which then issues a rate map based on the flood risk zones and specifying acturial

flood insurance rates for future developments. To qualify for the regular flood insurance program before expiration of the emergency program, the local government must then revise its floodplain management regulations in accordance with the refined floodplain outline and minimun Federal requirements as set forth in Section 1910 of the National Flood Insurance Program Regulations.

1.09 Table 1 indicates what phases of this process have been completed for each of the major local governments in the Cazenovia Creek Basin. H.U.D. has issued preliminary flood hazard area maps for each of the areas listed, thereby covering the entire basin. However, only four, the City of Buffalo, the Village of East Aurora, and the Towns of West Seneca and Elma have been declared eligible for emergency flood insurance coverage, indicating that the remaining communities have not as yet adopted preliminary floodplain management regulations and/or submitted applications to H.U.D. Three communities have had the Type 15 flood insurance studies completed for then, the Village of East Aurora and the Towns of West Seneca and Elma, but only East Aurora has had a rate map issued by H.U.D. to date. East Aurora has submitted revised floodplain management regulations and has qualified for participation in the regular flood insurance program.

Table 1

Flood Insurance Status for Communities in Cazenovia Creek Basin*

Community	Phase Completed				
	Preliminary Flood Hazard Area Maps	Declared Eligible for Emergency Coverage	Completion of Type 15 Study	H.U.D. Issued Rate Map	Declared Eligible for Regular Program
City of Buffalo	X	X			
Village of East Aurora	X	X	X	X	X
Town of West Seneca	X	X	X		
Town of Elma	X	X	X		
Town of Aurora	X				
Town of Boston	X				
Town of Colden	X				

Table 1 (cont'd)

Flood Insurance Status for Communities in Cazenovia Creek Basin*

Community	Phase Completed				
	Preliminary Flood Hazard Area Maps	Declared Eligible for Emergency Coverage	Completion of Type 15 Study	H.U.D. Issued Rate Map	Declared Eligible for Regular Program
Town of Concord	X				
Town of Sardinia	X				
Town of Holland	X				
Town of Orchard Park	X				
Town of Wales	X				

*As of 30 November 1974

1.10 Structural Features

1.11 The structural flood protection measure recommended for Cazenovia Creek is an ice retention structure to be constructed approximately one mile upstream of Union Road. A low-level dam across the creek would provide significant flood protection to floodprone areas downstream by creating a pond which would allow a stable ice cover to form behind the structure and hold back ice coming downstream during periods of ice breakup. Thus, the high water levels due to ice jamming would be eliminated and the degree of protection in the lower portion of the basin would be increased.

1.12 Since some ice will form below the structure and could flow downstream causing minor ice jamming in Reaches 1 and 2, these reaches may derive less direct benefit from the proposed structural works than Reach 3. Furthermore, the ice retention structure would not provide sufficient water storage capacity to reduce peak free flow and consequently does not provide protection against free flow high water levels. Throughout the major damage areas near Union Road Bridge, the ice-free stage for a given flow is significantly less (3 to 5 feet) than ice-affected stages.

1.13 The effect of the ice retention structure is to reduce the average annual damages along Cazenovia Creek from $153,500 to $4,000 except for Subreach 1A in which flood water from the Buffalo River is the major cause of flood damage water levels and Tannery Brook.

1.14 The locations and general design of the ice retention structure is shown on Plate 3. The structure would span the creek and adjacent valley with an overall length of approximately 900 feet. The structure itself would be a two-part system consisting of a lower and upper weir.

1.15 The lower weir, approximately 250 feet long (Plate 4), would have a crest elevation of 639 feet and maximum height of 9 feet above the creek thalweg. During late winter and early spring an 11 acre pool would be formed behind the structure and flow passing over the crest of the lower weir. The lower weir is designed to pass the 100-year discharge of 16,800 cfs. A discharge coefficient of 2.95 was used in designing the length of the lower weir and elevation of the upper weir. A stilling basin would be located at the base of the lower weir to reduce velocities during flood conditions. The stilling basin would span the creekbed and extend approximately 100 feet downstream from the structure.

1.16 An ice boom, shown on Plate 4 would be placed upstream of the structure to control ice flowing down the creek. The boom would hold the ice behind it allowing a stable cover to form on the pond. The winter stream flow would pass under the stable cover and discharge over the lower weir. During the ice breakup periods, the boom would hold the ice back to melt in place behind the ice retention structure during the spring thaw.

1.17 The upper weir (Plate 4) would have a crest elevation of 647 feet and width of approximately 3 feet. This section of the ice retention structure (approximately 665 feet long) would extend from the right end of the lower weir to the high ground along Seneca Street. The structure is designed to allow the Standard Project Flood (77,000 cfs) to pass over the ice retention structure without overtopping the abutments. Both ends of the ice retention structure would be tied into the high ground by means of wing walls. A discharge coefficient of 3.95 was used to design the top elevation of the wing walls on either end of the ice retention structure. Each wall would have a top elevation of 660 feet allowing 3 feet of freeboard above the Standard Project Flood level.

1.18 Three gated 36-inch drainage pipes would be placed through the lower weir to permit drainage of the pool behind the structure for maintenance and sediment removal. These are sufficiently large to pass normal summertime flows without causing ponding upstream of the structure.

1.19 Provided the implementation study (Advanced Engineering and Design Study) is authorized, the above described configuration of the ice retention structure will be investigated to verify both its structural and functional adequacies. During such study, specific investigations would be made to determine: the effects of possible loadings on the ice boom and dam; the ice-retaining efficiency of the ice retention structure; and, the erosive effect of possible two-stage flows on lands downstream from the dam.

1.20 Annual installation of the ice boom would be necessary after five days of freezing temperatures. Spring removal would take place after the ice has melted in the spring. Damaged or worn section of the ice boom would have to be replaced on a yearly basis. Sediment removal behind the ice retention structure and maintenance of the structure would be done as required.

1.21 Monitoring

1.22 During construction, the Contractor will be required to minimize temporary environmental impacts such as noise, dust, and water turbidity, in accordance with the procedures and regulations outlined in the Civil Works Construction Guide Specification for Environmental Protection (CE-1300, May 1970). In order to insure that these procedures and regulations are properly implemented, construction will be monitored by a Corps inspector. After construction has been completed, annual inspections will be conducted by the Corps to insure proper operation and maintenance of the project.

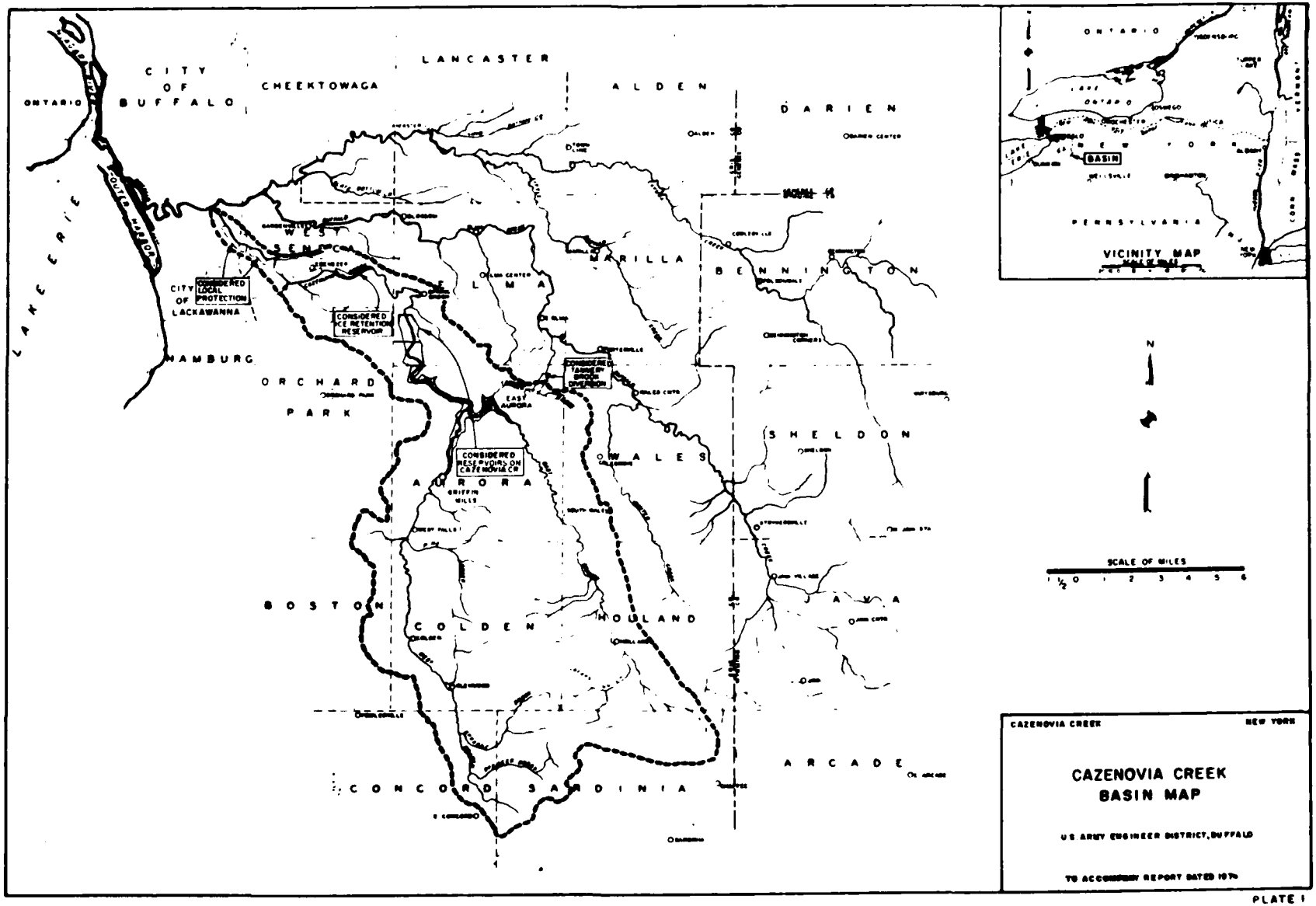
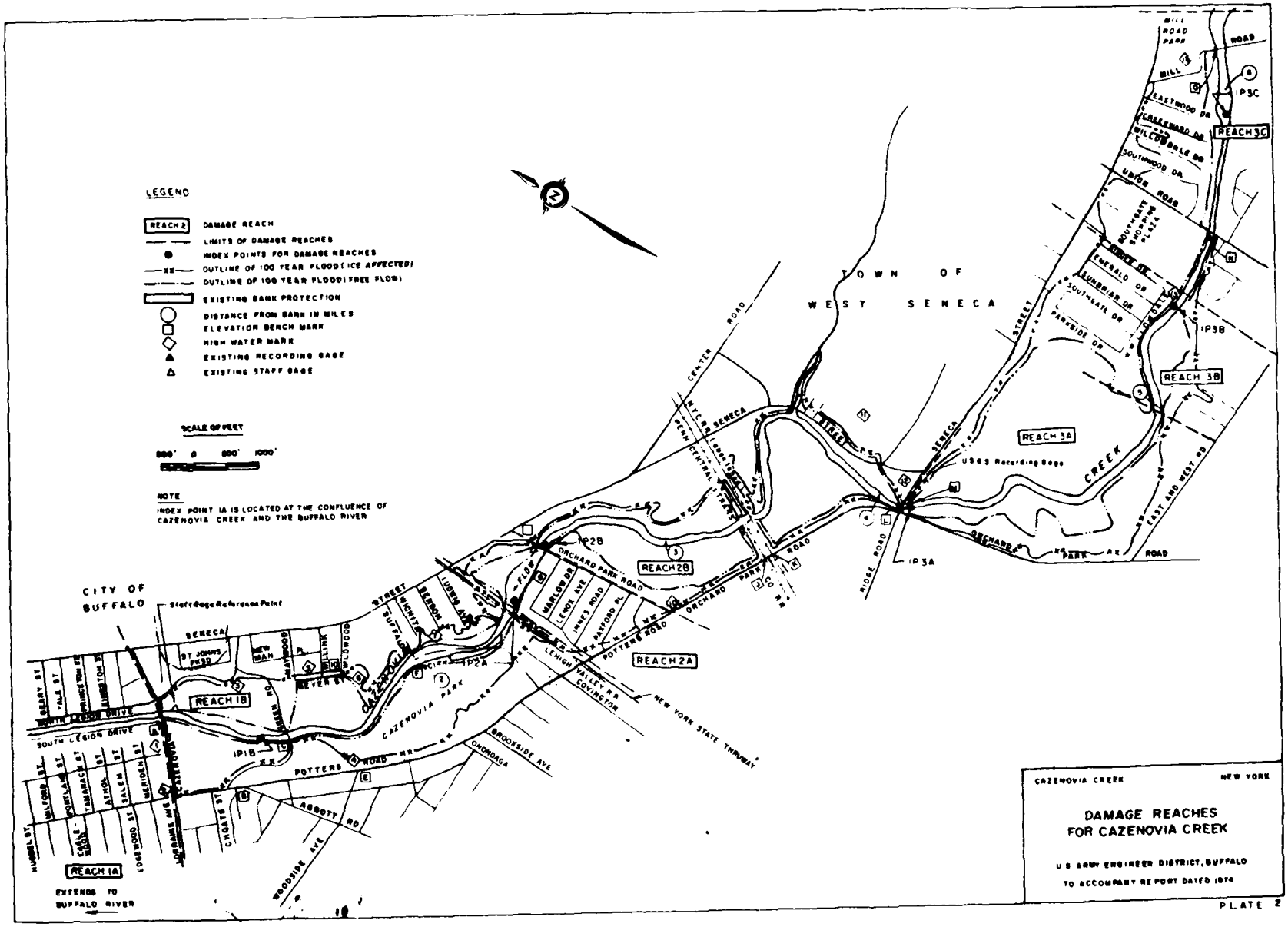

CITY OF BUFFALO
CHEEKTOWAGA
LANCASTER
ALDEN
DARIEN
ONTARIO
LAKE ERIE
NIAGARA RIVER
WEST SENECA
CITY OF LACKAWANNA
CONSIDERED LOCAL PROTECTION
CONSIDERED ICE RETENTION RESERVOIR
CONSIDERED RESERVOIRS ON CAYENOVIA CR
CONSIDERED VARIOUS SMALL DIVERSION
HAMBURG
ORCHARD PARK
EAST AURORA
AURORA
GRIFFIN MILLS
ELMA
MARILLA
BENNINGTON
SHELDON
WALES
BOSTON
COLDEN
HOLLAND
ARCADE
CONCORD
SARDINIA
ONTARIO
PENNSYLVANIA
BASIN
VICINITY MAP
N
SCALE OF MILES
1 ½ 0 1 2 3 4 5 6
CAZENOVIA CREEK
NEW YORK
CAZENOVIA CREEK
BASIN MAP
U.S. ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 197

PLATE 1


LEGEND
REACH 2 DAMAGE REACH
LIMITS OF DAMAGE REACHES
INDEX POINTS FOR DAMAGE REACHES
OUTLINE OF 100 YEAR FLOOD (ICE AFFECTED)
OUTLINE OF 100 YEAR FLOOD (FREE FLOW)
EXISTING BANK PROTECTION
DISTANCE FROM BANK IN MILES
ELEVATION BENCH MARK
HIGH WATER MARK
EXISTING RECORDING GAGE
EXISTING STAFF GAGE
SCALE OF FEET
0 500' 1000'
NOTE
INDEX POINT 1A IS LOCATED AT THE CONFLUENCE OF CAZENOVIA CREEK AND THE BUFFALO RIVER
TOWN OF WEST SENECA
CITY OF BUFFALO
REACH 1A
REACH 1B
REACH 2A
REACH 2B
REACH 3A
REACH 3B
REACH 3C
IP1A
IP1B
IP2A
IP2B
IP3A
IP3B
IP3C
USGS Recording Gage
Staff Gage Reference Point
CAZENOVIA CREEK
BUFFALO RIVER
EXTENDS TO BUFFALO RIVER
CAZENOVIA CREEK NEW YORK
DAMAGE REACHES FOR CAZENOVIA CREEK
U S ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1974
PLATE 2

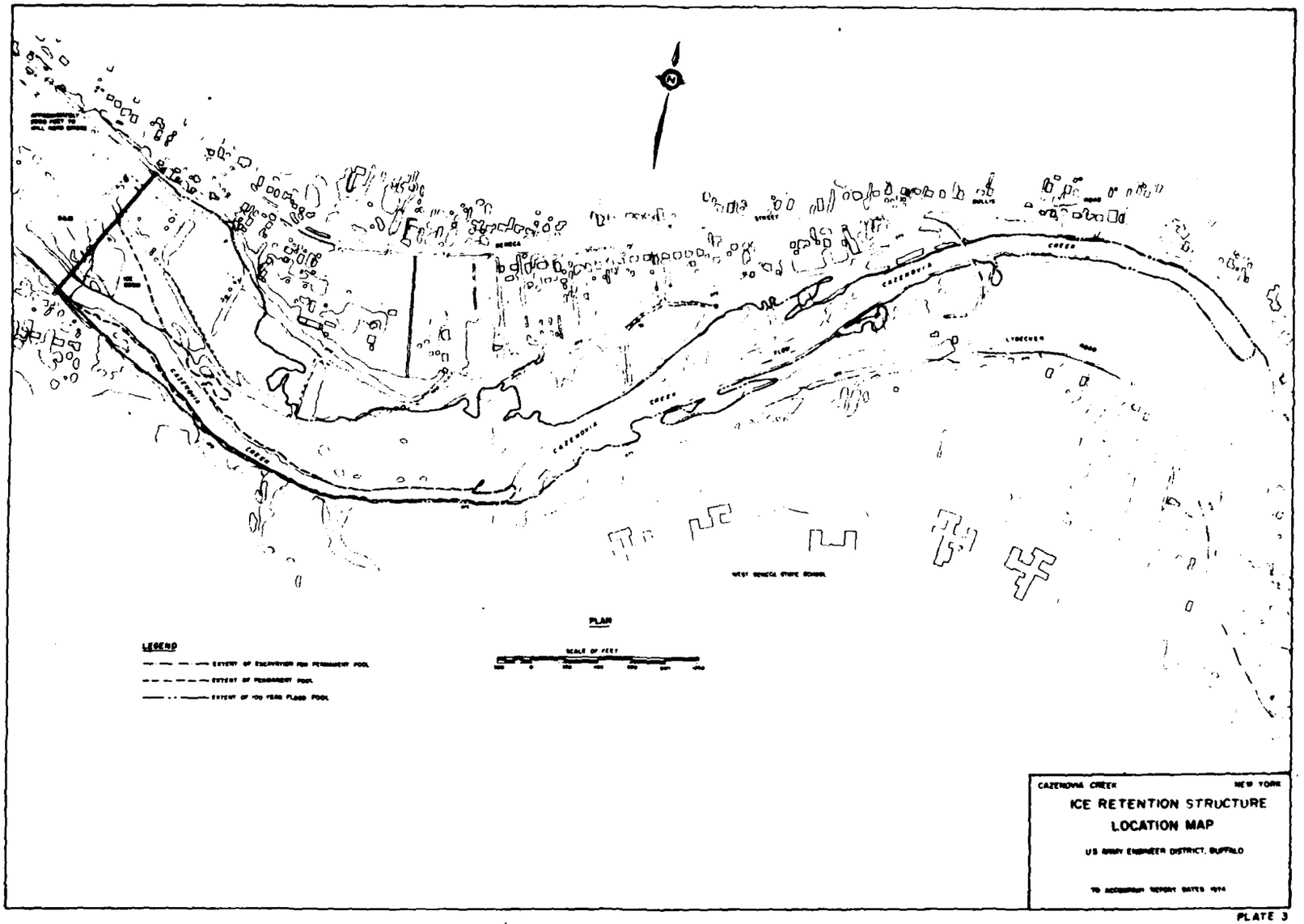
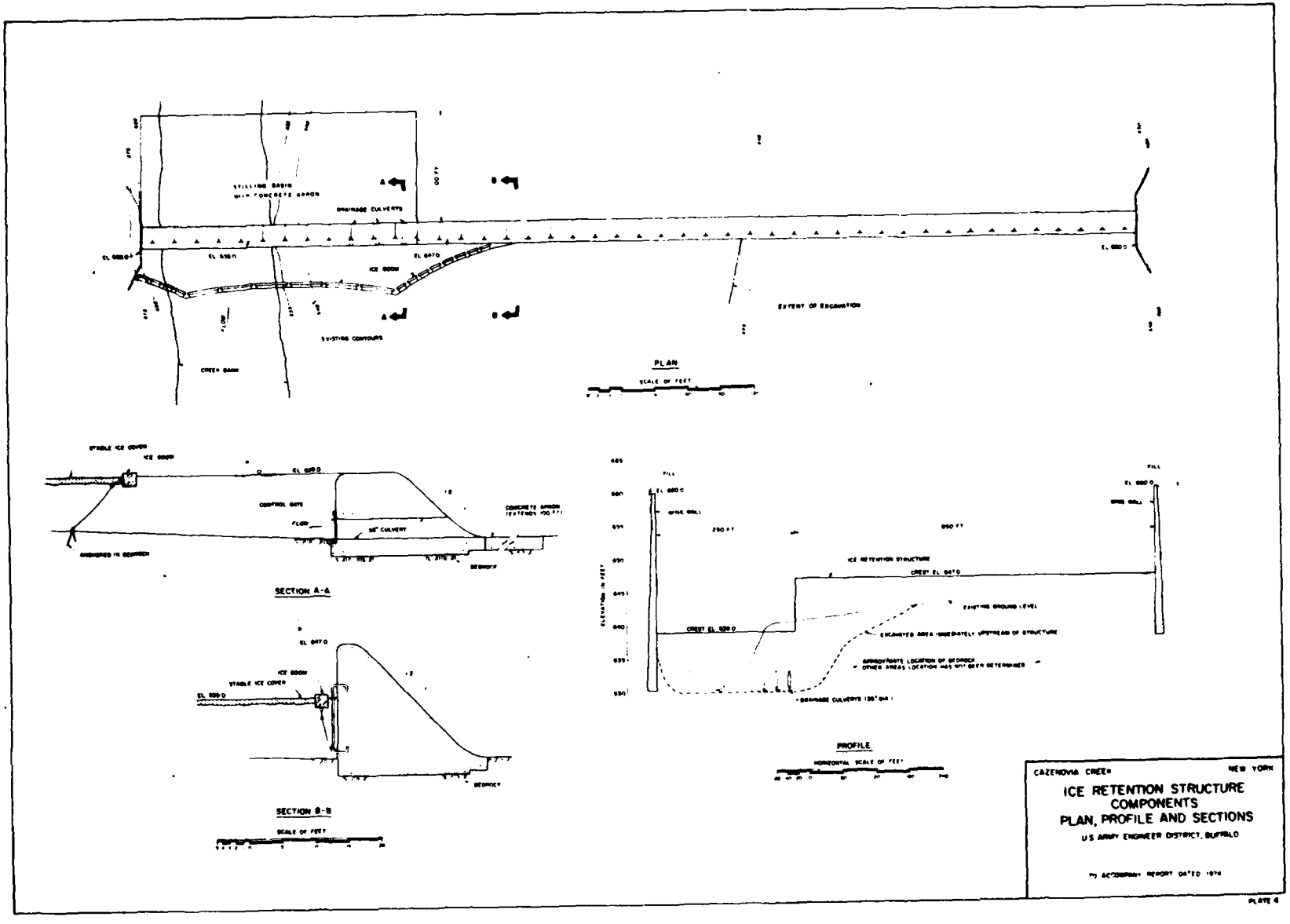

PLAN
LEGEND
CAZENOVIA CREEK
NEW YORK
ICE RETENTION STRUCTURE
LOCATION MAP
US ARMY ENGINEER DISTRICT, BUFFALO

PLATE 3


PLAN
SECTION A-A
SECTION B-B
PROFILE
CAZENOVIA CREEK
NEW YORK
ICE RETENTION STRUCTURE
COMPONENTS
PLAN, PROFILE AND SECTIONS
U S ARMY ENGINEER DISTRICT, BUFFALO
PLATE 6

SECTION 2

2. ENVIRONMENTAL SETTING WITHOUT THE PROJECT

2.01 Geography

2.02 Cazenovia Creek, the largest tributary of the Buffalo River, drains 144 square miles of central Erie County, New York. A basin map is shown on Plate 1. The creek is 39 miles in length. Approximately 17 miles above its confluence with the Buffalo River, Cazenovia Creek divides into two branches. The East Branch originates some four miles north of Sardinia and flows NNW through farmlands past the rural communities of Holland and South Wales and on to its confluence with the West Branch near East Aurora. The West Branch originates approximately four miles north of Springville and flows NNE through farm and wooded areas past Glenwood and Colden and on to East Aurora, where it joins the East Branch. The main stream follows a wandering northwestern course from this juncture, flowing through a steep-walled gorge in the Town of Elma on through suburban West Seneca to its confluence with the Buffalo River in the City of Buffalo. Tannery Brook, a floodprone tributary of Cazenovia Creek, flows through East Aurora and joins the East Branch of Cazenovia Creek just south of the town's populous residential sector.

2.03 For the purpose of this report, the Cazenovia Creek basin is divided into three parts: the upper basin, above the confluence of the East and West Branches; the central basin, including the Towns of Elma and Aurora, parts of the Town of Orchard Park, and the Village of East Aurora; and the lower basin, comprised of South Buffalo and the Town of West Seneca. Flood damages are greatest in the lower basin and in the Village of East Aurora. Proposed remedial efforts would have their greatest overall impact upon the lower and central basins. The upper basin experiences relatively minor flood damages and would be little affected by downstream remedial measures. Therefore, its treatment in this report will be brief.

2.04 Climate

2.05 The climatological data used in the Cazenovia Creek study was obtained from 12 stations in or near the Buffalo River basin, ten of which are still in operation. Table 2 lists the stations and their period of record, type, elevation, and location. There is no first-order station within the basin. The Weather Bureau at the Buffalo Airport is the nearest first-order station. The locations of the stations are shown on Plate 5.

Table 2

Climatological Station in and Adjacent to Buffalo River Basin

Station	Period of Record	Type	Elevation	Location	
				Latitude	Longitude
Arcade	1889-1907 1943-Present	NH	1,480	42°32'	78°25'
Batavia	1931-Present	CH	900	43°00'	78°11'
Buffalo W.B. Airport	1832-Present	CHJ	705	42°56'	78°44'
Derby 2 N.W.	1945-1961	NH	660	42°42'	79°00'
Elma	1942-1960	CH	765	42°51'	78°39'
Gowanda State Hospital (1)	1945-Present	CHJ	870	42°29'	78°56'
Linden	1912-1968	N	1,120	42°53'	78°10'
South Wales Emery Park (2)	1931-Present	NH	1,090	42°43'	78°36'
Stafford	1931-1969	NH	915	42°59'	78°05'
Wales	1948-Present	C	1,090	42°44'	78°31'
Warsaw 5 S.W.	1952-Present	N	1,715	42°41'	78°12'
Wiscoy	1940-Present	NH	1,140	42°30'	78°05'

(1) Known as Gowanda prior to May 1951.
(2) Known as South Wales prior to April 1951.
C - Recording gage
N - Non-recording gage
H - Snowfall Data
J - Supplemental data

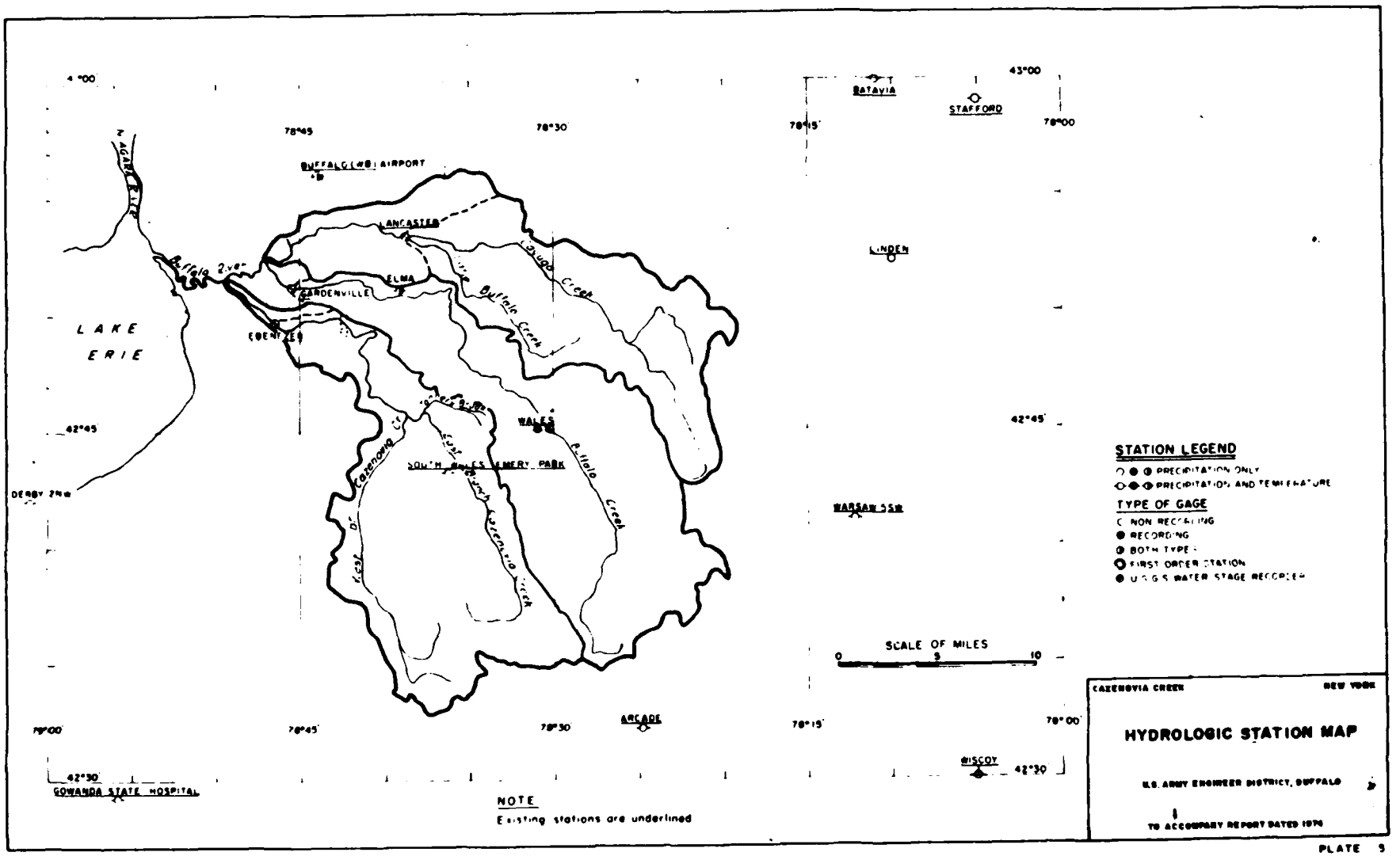

43°00'
78°45'
78°30'
78°15'
78°00'
42°45'
42°30'
BATAVIA
STAFFORD
LINDEN
WARSAW 5SW
WISCOY
ARCADE
BUFFALO(WB) AIRPORT
LANCASTER
ELMA
GARDENVILLE
EDEN 2ES
WALES
SOUTH WALES EMERY PARK
LAKE ERIE
DERBY 2NW
GOWANDA STATE HOSPITAL
Buffalo River
Buffalo Creek
Cazenovia Creek
East Branch Cazenovia Creek
SCALE OF MILES
0 5 10
STATION LEGEND
PRECIPITATION ONLY
PRECIPITATION AND TEMPERATURE
TYPE OF GAGE
NON RECORDING
RECORDING
BOTH TYPES
FIRST ORDER STATION
U.S.G.S. WATER STAGE RECORDER
NOTE
Existing stations are underlined
CAZENOVIA CREEK NEW YORK
HYDROLOGIC STATION MAP
U.S. ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1976

PLATE 5

2.06 Precipitation data for the Buffalo River basin is contained in Table 3 which lists average monthly and annual values, and combined averages for all weather stations. The average annual precipitation of all the stations throughout the basin is 36.92 inches. Monthly averages for the twelve stations vary from a minimum of 2.53 inches in February to a maximum of 3.33 inches in May. The highest average monthly precipitation, 4.34 inches, occurs in September at the South Wales Emergy Park station. The lowest average monthly precipitation, 2.07 inches, occurs in January at the Wiscoy Station. Average annual precipitation varies from 31.27 inches at Stafford to 40.96 inches at South Wales Emery Park. Plate 6 shows rainfall contours for the Cazenovia Creek basin.

2.07 Snowfall data is given in Table 4. The average annual snowfall for the stations shown is 82.3 inches. The highest monthly average snowfall is 22.4 inches, occurring in January at Arcade. Plate 7 gives snowfall contours for the study area.

2.08 Temperature data is presented in Table 5. The average annual temperature of the ten stations shown is 46.9 degrees Fahrenheit. The maximum average monthly temperature is 69.2 degrees Fahrenheit occurring in July, while the minimum is 24.2 degrees Fahrenheit, in January.

2.09 Air Quality

2.10 Air quality data have been compiled since 1966 by the Air Pollution Control Division of the Erie County Department of Health. Table 6, derived from the County's "1973 Annual Report," lists mean levels of suspended particulates and sulfation rate (a measure of atmospheric oxides of sulfur) for the years 1966 and 1972. The improvement noted is attributed to strict enforcement of Air Pollution Codes written in 1967. According to County Codes, the maximum permissible annual geometric mean level of suspended particulates is 75 micrograms/cubic meter and the maximum permissible annual arithmetic mean rate of sulfation is 0.4 milligrams sulfate/cm^2/30 days. High pollutional levels occur in the vicinity of and downwind from major industrial zones. In the Cazenovia Creek basin, air pollution problems are generally confined to South Buffalo and the northwestern corner of West Seneca.

2.11 Topography

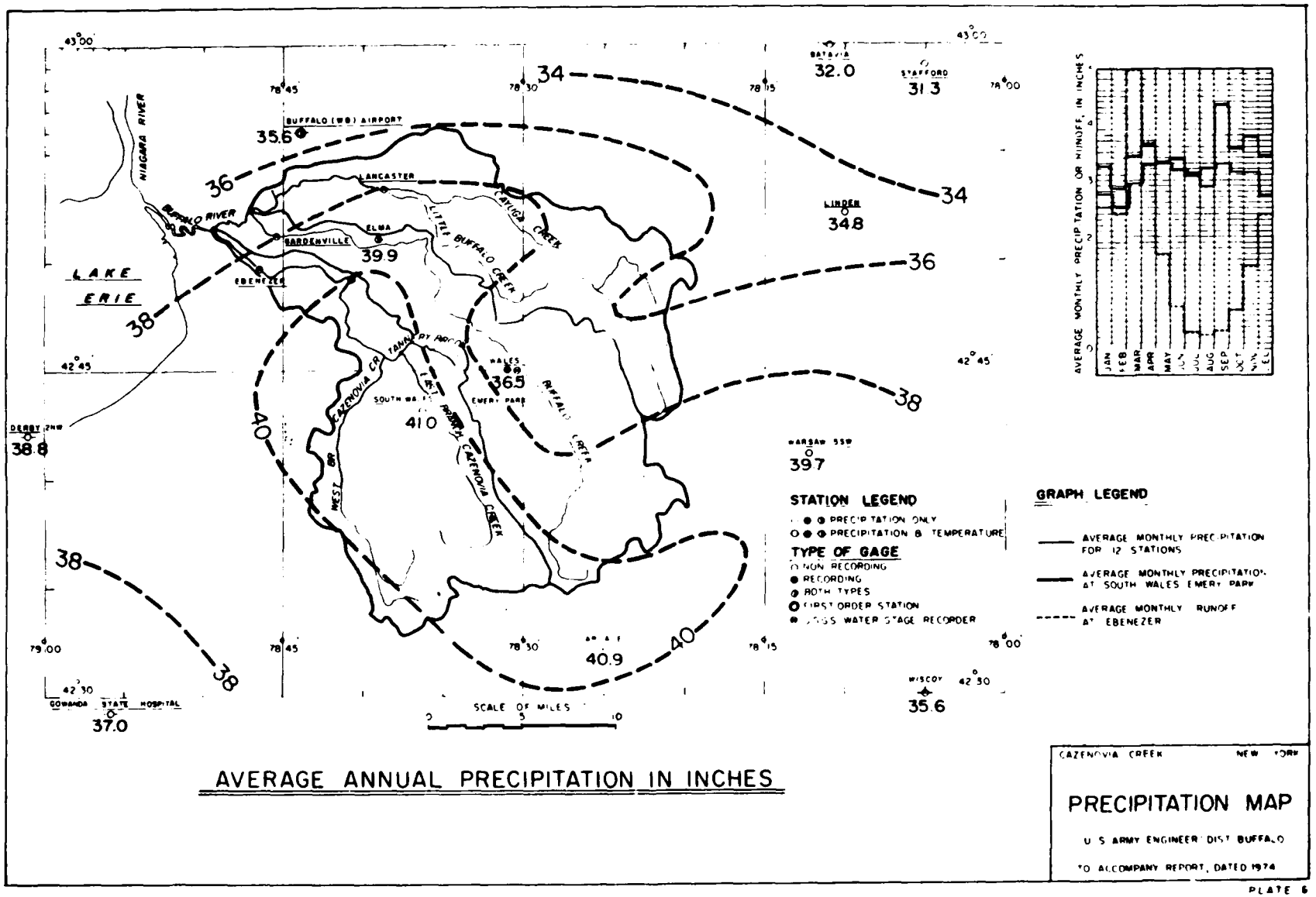
2.12 The basin is characterized by a series of nearly level plains rising to the south, bounded by steep escarpments facing north. The East and West Branches of Cazenovia Creek have deeply eroded the northern edge of the Allegheny Plateau, highest of these plains. Eroded materials are deposited on the Erie Plain, where the creek becomes wide and sluggish and the channel partially obstructed by extensive shoals. Topographic data for Cazenovia Creek are given in Table 7.

Table 3

Average Monthly Precipitation in Inches

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Arcade	3.17	2.61	3.01	3.19	4.01	4.17	3.91	3.64	3.66	3.36	3.10	3.10	40.93
Batavia	2.19	2.25	2.60	2.99	3.10	2.77	2.89	3.08	2.72	2.60	2.58	2.26	32.03
Buffalo W. B. Airport	3.11	2.83	2.84	2.62	2.93	2.78	2.89	2.94	3.09	3.18	3.14	3.20	35.55
Derby 2 N.W.	3.05	2.50	3.07	3.67	3.67	2.95	2.51	3.11	3.77	3.57	4.30	2.84	38.84
Elma	3.74	2.99	3.39	3.65	3.53	2.79	3.08	3.02	3.78	3.44	3.95	3.11	39.91
Gowanda State Hospital (1)	2.82	2.44	2.77	3.32	3.39	3.54	3.33	3.08	3.28	3.13	3.15	2.71	36.96
Linden	2.37	2.30	2.61	3.01	3.07	3.46	3.25	3.28	3.07	3.19	2.92	2.31	34.83
South Wales Emery Park (2)	3.25	2.86	3.43	3.64	3.33	3.37	3.08	2.89	4.34	3.56	3.77	3.44	40.96
Stafford	2.21	2.24	2.42	2.89	3.02	2.69	2.84	2.94	2.81	2.65	2.48	2.08	31.27
Wales	2.92	2.51	3.36	3.39	3.09	2.64	3.24	2.94	3.04	3.11	3.05	3.19	36.48
Warsaw 5 S.W.	2.92	2.81	3.43	4.00	3.20	3.46	3.19	4.25	3.05	3.55	2.99	2.84	39.69
Wiscoy	2.07	2.11	2.76	3.27	3.59	3.66	3.74	3.39	3.15	2.87	2.74	2.29	35.64
Average	2.78	2.53	2.97	3.30	3.33	3.19	3.16	3.21	3.31	3.18	3.18	2.78	36.92

(1) Known as Gowanda, prior to May 1951.
(2) Known as South Wales, prior to April 1951.



AVERAGE ANNUAL PRECIPITATION IN INCHES

CAZENOVIA CREEK NEW YORK

PRECIPITATION MAP

U S ARMY ENGINEER DIST BUFFALO

TO ACCOMPANY REPORT, DATED 1974

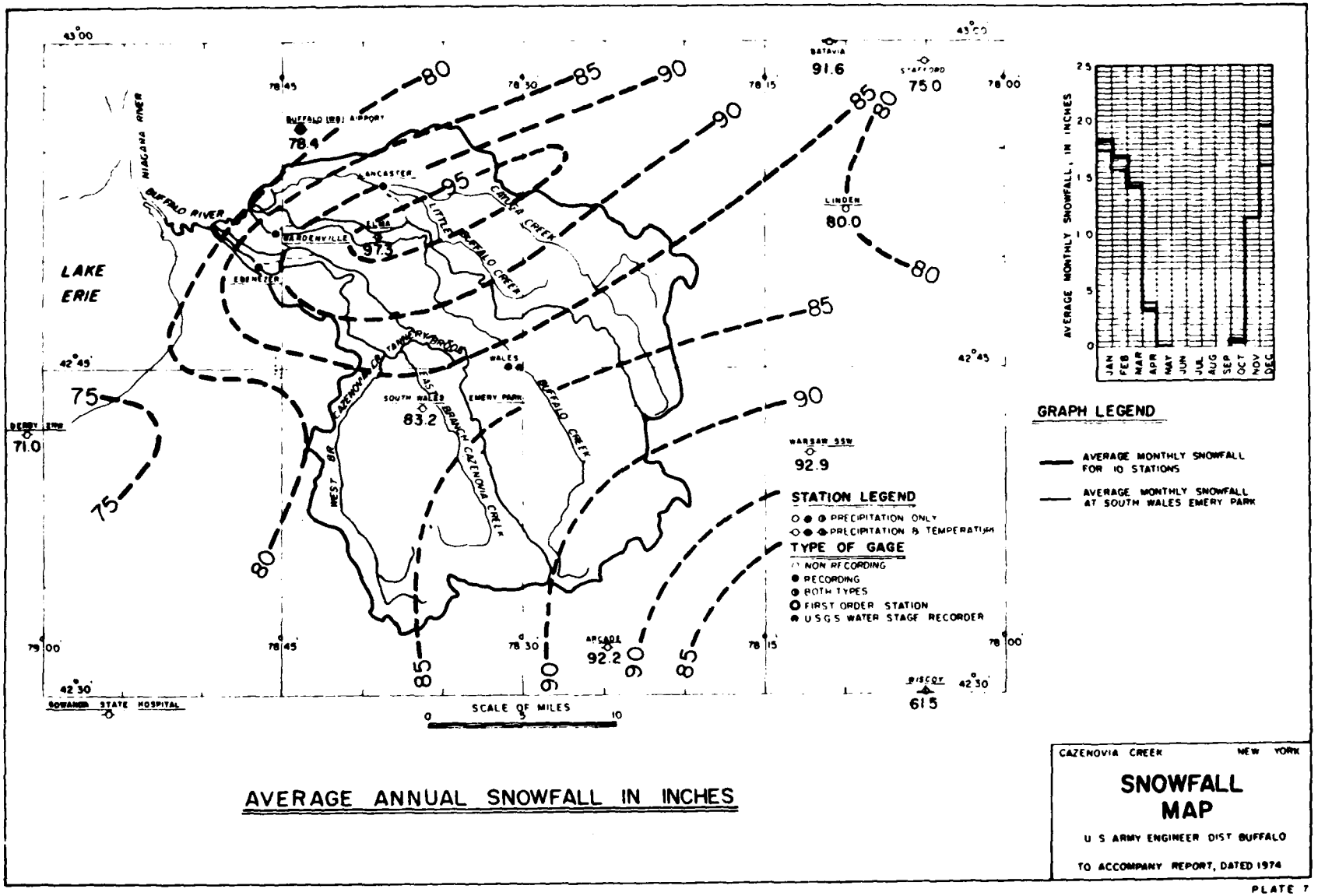
PLATE 6

Table 4

Average Monthly Snowfall in Inches

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Arcade	22.4	17.5	15.2	4.1	0.3	T	0	0	T	1.3	11.8	19.6	92.2
Batavia	20.1	21.5	16.0	4.2	0.3	0	0	0	T	0.3	11.3	17.6	91.6
Buffalo W.B. Airport	19.6	17.6	11.5	3.2	0.2	0	0	0	T	0.4	7.9	18.0	78.4
Derby 2 N.W.	16.2	11.5	10.9	1.3	T	0	0	0	0	0.1	15.1	15.9	71.0
Elma	21.8	18.4	15.4	2.6	0.1	0	0	0	T	0.1	17.8	21.1	97.3
Linden	19.7	19.2	13.1	2.9	0	0	0	0	0	T	10.4	14.8	80.0
South Wales Emery Park (1)	17.4	15.7	14.4	3.9	0.1	T	0	0	0	0.6	11.4	19.7	83.2
Stafford	16.1	18.1	15.1	3.0	T	0	0	0	0	2.0	8.9	13.6	75.0
Warsaw	18.5	17.3	19.6	7.0	0.3	0	0	0	0	0.5	12.5	17.2	92.9
Wiscoy	12.5	13.0	11.8	1.6	0.1	0	0	0	0	0.1	8.4	14.0	61.5
Average	18.4	17.0	14.3	3.3	0.1	T	0	0	T	0.4	11.6	16.2	82.3

(1) Known as South Wales, prior to April 1951.
T - Trace



CAZENOVIA CREEK NEW YORK

SNOWFALL MAP

U S ARMY ENGINEER DIST BUFFALO

TO ACCOMPANY REPORT, DATED 1974

PLATE 7

Table 5

Average Monthly Temperature in Degrees Fahrenheit

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Arcade	21.2	24.6	30.0	44.5	54.8	63.4	67.1	66.1	59.4	49.2	38.1	25.6	45.3
Batavia	23.9	25.2	32.6	44.9	55.4	65.5	69.2	68.1	61.2	51.4	39.2	27.3	47.0
Buffalo W.B. Airport	25.0	24.7	32.0	43.0	54.3	64.8	70.1	68.5	62.3	51.1	39.4	29.2	47.1
Derby 2 N.W.	27.7	27.5	33.0	45.0	54.2	65.0	70.1	69.3	62.9	53.4	41.9	30.9	48.4
Elma	24.8	25.8	32.5	44.7	54.6	64.5	69.0	67.7	60.6	51.0	39.3	28.0	46.9
Gowanda State Hospital (1)	26.6	27.7	33.6	47.1	56.7	66.3	70.5	69.2	63.1	53.9	41.4	28.6	48.7
South Wales Emery Park	23.8	23.9	31.5	44.0	55.0	64.6	69.1	67.4	60.4	50.2	38.3	27.3	46.3
Stafford	24.7	24.7	32.6	45.4	57.0	66.9	71.3	69.4	62.4	52.0	39.7	28.3	47.9
Warsaw 5 S.W.	19.9	22.9	28.1	44.3	54.1	63.0	66.6	65.7	59.3	49.6	37.1	24.6	44.6
Wiscoy	24.3	25.2	32.2	45.6	55.8	65.3	69.1	67.4	60.9	50.7	38.7	27.4	46.9
Average	24.2	25.2	31.0	44.9	55.2	64.9	69.2	67.9	61.2	51.3	39.3	27.7	46.9

(1) Known as Gowanda, prior to May 1951.
(2) Known as South Wales, prior to April 1951.

Table 6

Air Quality Data For Cazenovia Creek Basin*

Suspended Particulates - Annual Geometric Mean Level[1], Micrograms Per Cubic Meter		
Location	1966	1973
Upper Basin	less than 60	less than 40
Central Basin	60 - 80	less than 50
West Seneca	80 - 140	50 - 90
South Buffalo	160 - 200	90 - 120

Sulfation Rate - Annual Arithmetic Mean Level[2], Milligrams Sulfate/cm^2/30 Days		
Location	1966	1973
Upper Basin	less than 0.4	less than 0.2
Central Basin	less than 0.4	less than 0.2
West Seneca	less than 0.8	less than 0.3
South Buffalo	0.8 - 1.2	0.4

1. Geometric Mean: The n^{th} root of the product of n measurements.

2. Arithmetic Mean: The sum of n measurements divided by n.

*Data adapted from: "1973 Annual Report, Air Pollution Control Division, Erie County Department of Health".

Table 7

Cazenovia Creek Topographic Data

Reach	Length, Mi.	Upstream Elevation Ft.	Downstream Elevation Ft.	Average Slope Ft./Mi.	Drainage Area, Sq. Mi.
Main Stream below confluence of East and West Branch	17	805	576	13.5	26
East Branch	21	1,760	805	45.5	57
East Aurora to Holland	15	1,080	805	18.3	39
Holland to Source	6	1,760	1,080	113.3	18
West Branch	19	1,700	805	47.1	61
East Aurora to Colden	10	1,060	805	25.5	34
Colden to Source	9	1,700	1,060	71.1	27

2.13 Along much of its length, Cazenovia Creek is a shallow stream during most of the year. Its bed is largely a pavement of bare or silt-dusted rock, either gray-black flaky shale or hard massive limestone, interrupted periodically by extensive gravel shoals. The streambed is graded in an irregular step-like manner. In places, small scarps are formed as limestone outcroppings with underlying shale are undercut. Between scarps, flow may be so slow during low water conditions that its direction cannot be determined at a glance. Notably lacking are deep pools which might harbor large fish. The average summertime depth of the stream is certainly less than 1-foot over much of its length. Well developed riffle areas are uncommon and generally limited in extent. This is very likely due to the character of the bedrock, which erodes into predominantly large blocky boulders (limestone) or small flake-like chips (shale), neither creating sufficient turbulence in such a slow stream to form well developed riffles.

2.14 The character of the stream changes markedly near its confluence with the Buffalo River. Even during moderate stages the

river backs up into the creek channel, so that surface waters may flow upstream in the lowest reaches of the creek. This backwater effect has led to the formation of an extensive sediment pool with an attendant increase in turbidity.

2.15 The course of Cazenovia Creek downstream of Spring Brook was considerably modified by the northward retreat of the ice front during the final stages of the last glaciation. This ice sheet was also responsible for the generally subdued topography and the glacial, fluvio-glacial, and lacustrine deposits in the study area.

2.16 Geological Investigation

2.17 The geological investigation commenced with a review of published geological literature. Geotechnical references are listed in the bibliography. Data on the bedrock of the basin area is given by Broughton et. al. (1962) and Buehler and Tesmer (1963). A review of the geologic history of the area, with emphasis on postglacial lakes in the area, is given by Calkin (1969).

2.18 Data on the superficial geology of the area is given in two unpublished M.A. theses from the Department of Geology, State University of New York at Buffalo (Blackman 1956 and Symecko 1967). Superficial geology maps of portions of the basin are given in these theses. Data on the ground water resources of the area is published by Reck and Simmons (1952) and La Sala (1968).

2.19 The published data was supplemented by interviews with staff of the Department of Geology, University of Buffalo and staff of the Soil Conservation Service, U. S. Department of Agriculture, East Aurora, New York.

2.20 Geologic field mapping was undertaken for five days during September 1973 to verify and confirm the published data previously gathered.

2.21 Valley cross-sections, based upon testhole drilling, are available for the two damsites which have been investigated on Cazenovia Creek during the last decade - the Spring Brook Site investigated by the U. S. Army Corps of Engineers in 1963 and a site located some 4,500 feet upstream investigated by the New York State Department of Environmental Conservation during 1967.

2.22 Mineral resources within the watershed include carbonate rocks, natural gas, sand and gravel, shale, clays, gypsum, and possibly, salt. The United States Department of the Interior - Bureau of Mines indicates that these mineral resources are widespread throughout

Erie County and that no mineral production is being carried out within the reaches of the stream to be affected by the proposed measures. As the area to be effected by control measures will probably not exceed 35 acres along the stream, no significant impact on mineral resources is anticipated.

2.23 Bedrock Geology

2.24 The bedrock underlying the study area consists of sedimentary formation of Middle and Upper Devonian age. The geologic column and description of rock units is given in Table 8 and the bedrock geology is shown on Plate 8.

2.25 Apart from the Onondaga limestone which appears at the surface in the extreme northwest of the study area, the bedrock sequence traversed by Cazenovia Creek is composed of 600 feet of predominantly dark grey and black shales of Middle and Upper Devonian age dipping to the south at approximately 40 feet per mile. This is locally affected by minor folding which may modify the dip to as much as 60 feet per mile or as little as 17 feet per mile (de Witt, 1956). The strike of the beds is uniformly east-west. Interbedded with the shales are numerous thin, impure limestones, siltstones, and large calcareous concretions up to 6 feet in diameter.

2.26 Jointing is best developed in the massive shale members, often occurring as two diagonal sets. From field observations in Cazenovia valley, the dominant joint set appears to be vertical, striking approximately east-west.

2.27 Where undercut by stream erosion, the shale cliffs are stable at near vertical angles and cliffs up to 100-foot high, sloping at 10 degrees from vertical (5 vertical to 1 horizontal), show little or no landslip activity. Weathering of the rock appears to be rapid and penetrates to depths of over a foot in the more fissile shales leaving a friable surface. The shales are nonporous with low permeability.

2.28 Surficial Geology

2.29 The surficial geology of the study area is largely the result of Pleistocene glaciation. The area was subjected to a succession of ice advances and retreats, resulting in deposits of glacial till and a complex pattern of fluvio-glacial and lacustrine sediments. The heterogeneous superficial deposits contrast with the relatively uniform nature of the bedrock geology. Surficial geology exerts a strong influence on groundwater behavior in the study area and is an important factor in assessing the engineering feasibility of major works

Table 8

General Geologic Column of the Area

System	Group	Formation	Member	Lithology	Approximate Thickness in Study Area
Upper Devonian	Seneca	West Falls	i) Angola Shale	Light grey shale with concretions, impure limestone and siltstone bands throughout	300 ft.
			ii) Rhinestreet Shale	Fissile to massive black petroliferous shale. Numerous large concretions	170 ft.
		Sonyea	i) Cashagua	Olive-grey soft shale with concretionary bands	50-70 ft.
			ii) Middlesex Shale	Black, strongly jointed shale, some concretions	
		Genesee	i) West River Shale	Finely laminated, black petroliferous shale	10-20 ft.
			ii) Genundewa Limestone	Dark grey concretionary shale	
			iii) Penn Yan Shale	Medium-grey nodular limestone	
			iv) Geneseo Shale	Dark grey shale with concretions	

Table 8 (Cont'd)

General Geologic Column of the Area

System	Group	Formation	Member	Lithology	Approximate Thickness in Study Area
Middle Devonian	Hamilton	Moscow	i) Windom Shale	Medium grey to olive-grey calcareous; numerous concretions	45 ft.
			ii) Kashong Shale	Soft grey, thin unit at base of the formation	
		Ludlowville	i) Tichenor Limestone	Massive, thin unit, fossiliferous, resistant to erosion	120 ft.
			ii) Wanakah Shale	Medium grey fossiliferous calcareous, numerous concretions	
			iii) Ledyard Shale	Dark grey, calcareous, numerous partings	
			iv) Centerfield Limestone	Massive thin unit	
		Skaneateles	i) Levanna Shale	Dark grey, calcareous	70 ft.
			ii) Stafford Limestone	Massive fossiliferous unit	
		Marcellus	i) Oatka Creek Shale	Black calcareous shale, calcareous concretions	50 ft.

Table 8 (Cont'd)

General Geologic Column of the Area

System	Group	Formation	Member	Lithology	Approximate Thickness in Study Area
Middle Devonian	Hamilton	Onondaga	i) Moorehouse Limestone	Light grey limestone, numerous corals, cherty	110 ft.
			ii) Nedrow Limestone	Intermixed light-grey limestone and dark grey chert	
			iii) Edgecliff	Light-grey limestone with chert nodules, coralline locally	

NOTE: All information based on previous studies

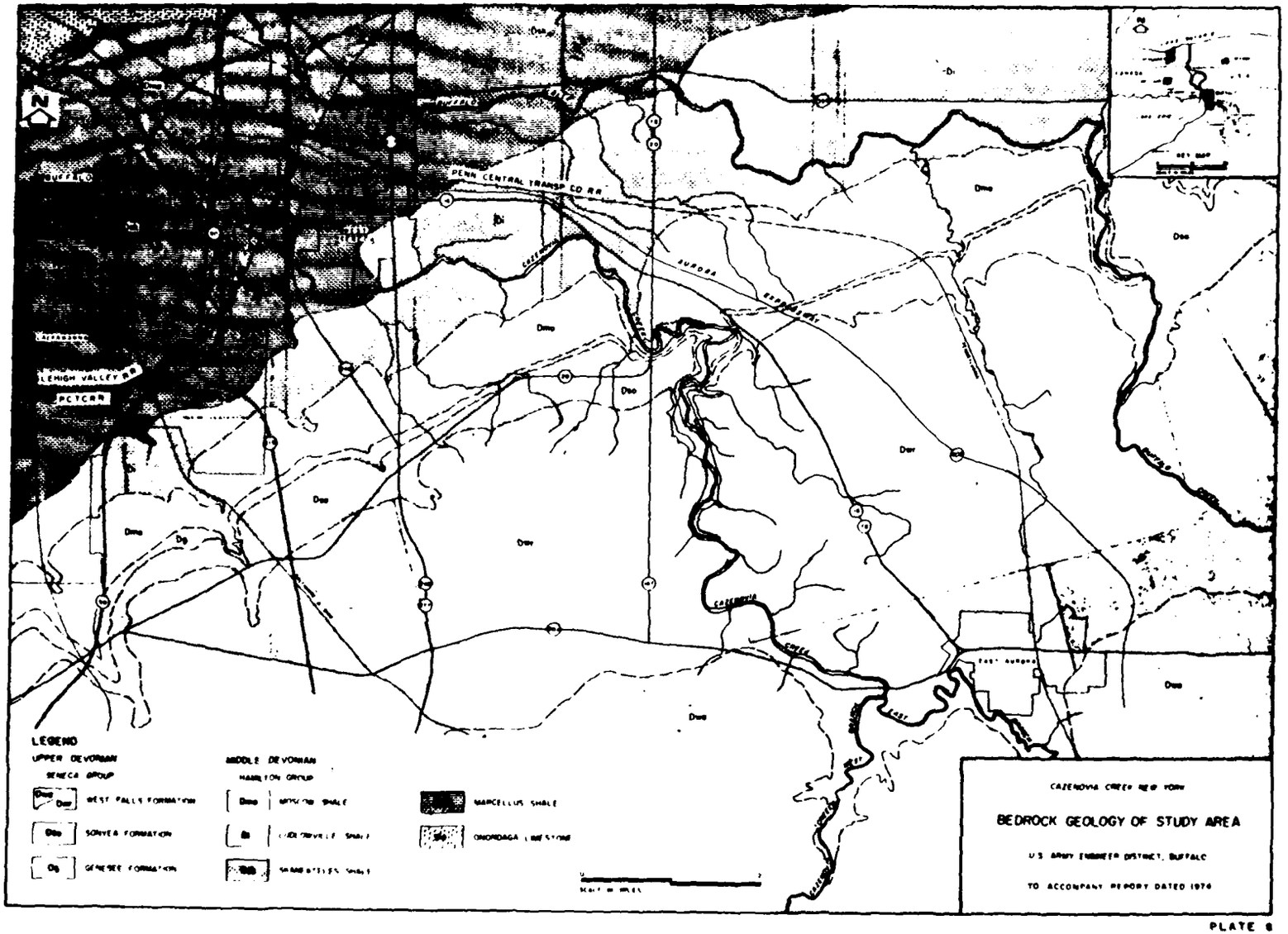

PENN CENTRAL TRANSP CO RR
AURORA
LEHIGH VALLEY RR
PENCAN
CAZENOVIA CREEK NEW YORK
BEDROCK GEOLOGY OF STUDY AREA
U.S. ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1974
LEGEND
UPPER DEVONIAN
SENECA GROUP
WEST FALLS FORMATION
SONYEA FORMATION
GENESEE FORMATION
MIDDLE DEVONIAN
HAMILTON GROUP
MARCELLUS SHALE
ONONDAGA LIMESTONE

PLATE 8

in this study. Plate 9 shows the surface deposits blanketing the bedrock of the study area and locates several buried valleys representing ice-diverted courses of Cazenovia Creek.

2.30 Thickness of superficial deposits varies from a few feet to a drill-proven depth of over 130 feet north of East Aurora. The major units of overburden encountered in the study area include:

(a) Glacial Till

2.31 Two belts of glacial till material cross the study area, the Alden end moraine to the north of Cazenovia Creek and the Hamburg/Marilla end moraine in the southern half of the study area.

2.32 The Alden moraine is predominantly a grey clayey till with abundant large boulders of Onondaga limestone. It is largely masked by a cover of glacial lake sediments originating from glacial lakes Warren and Whittlesey which existed after recession of the ice sheet northwards. Where exposed at surface, the Alden moraine is responsible for relief features in the order of 40 feet west of Spring Brook and 10 feet in the east. The average content of seven representative samples has been determined to be 18 percent sand, 42 percent silt, and 40 percent clay (Symecko, 1967).

2.33 The Hamburg/Marilla end moraine is more important to the present studies as it incorporates a belt 3 miles wide crossing the study area from southwest to northeast. In addition to glacial till, there are ice-marginal contact gravel deposits and outwash deltaic deposits incorporated in this moraine. The till material has been analyzed from five samples to contain 28 percent sand, 37 percent silt, and 35 percent clay. Locally derived bedrock shale provides most of the clay fraction. The color of the till is grey or brown. The depth of till is extremely variable and difficult to assess. Drill hole information and field observations indicate an average depth of approximately 15 feet, but this is increased to over 50 feet where glacial meltwater channels are buried by till. Till-derived colluvial material has built up to similar thicknesses in certain parts of Cazenovia gorge.

(b) Ice Contact Deposits

2.34 The Hamburg moraine deposits include, in addition to a base of unstratified compacted till, thick unevenly distributed sands and gravels or till producing a characteristic "kame and kettle" topography. These deposits were laid down in standing water and stagnant wasting ice at the tip of the receding glacier. They occur in two areas. North of Orchard Park, small kames have been largely removed to provide gravel fill material. North of East Aurora, a contrast in relief of 100 feet

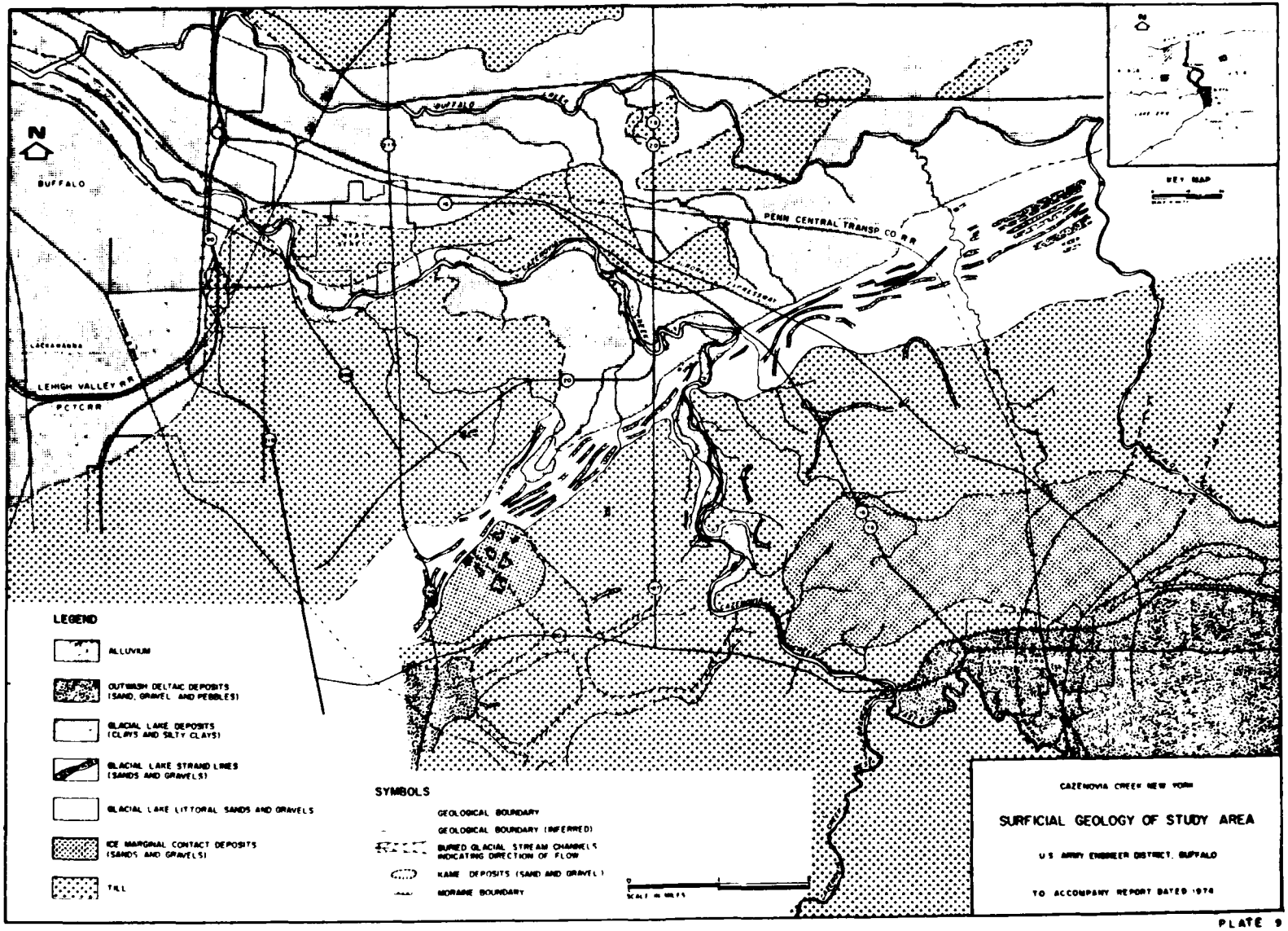

BUFFALO
PENN CENTRAL TRANSP CO RR
LEHIGH VALLEY RR
PCTCRR
KEY MAP
LEGEND
ALLUVIUM
OUTWASH DELTAIC DEPOSITS (SAND, GRAVEL AND PEBBLES)
GLACIAL LAKE DEPOSITS (CLAYS AND SILTY CLAYS)
GLACIAL LAKE STRAND LINES (SANDS AND GRAVELS)
GLACIAL LAKE LITTORAL SANDS AND GRAVELS
ICE MARGINAL CONTACT DEPOSITS (SANDS AND GRAVELS)
TILL
SYMBOLS
GEOLOGICAL BOUNDARY
GEOLOGICAL BOUNDARY (INFERRED)
BURIED GLACIAL STREAM CHANNELS INDICATING DIRECTION OF FLOW
KAME DEPOSITS (SAND AND GRAVEL)
MORAINE BOUNDARY
CAZENOVIA CREEK NEW YORK
SURFICIAL GEOLOGY OF STUDY AREA
U S ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1974

PLATE 9

occurs between the flooded kettle holes and adjoining kames. These kames appear to be composed largely of rounded cobbles and locally-derived shale fragments. The proportion of sand is very low (approximately 10 percent). Silt and clay comprise about 50 percent of the material. Water wells in this vicinity have the largest yield of any wells in the unconsolidated deposits of the Buffalo-Niagara Falls region.

2.35 The aquifer zone exists at depths of greater than 40 feet with coefficients of transmissibility of 10,000 to 20,000 gallons per day per foot (gpd/ft). The drill log shown in Table 9 shows a zone of coarse sand and gravel from 48 feet to 123 feet with considerably less silt and clay fraction than was observed at the surface.

(c) Outwash Deltaic Deposits

2.36 The damming effect of the ice that deposited the Hamburg end moraine led to a backup of northward flowing streams and accumulating meltwater which escaped westward, cutting deep drainage channels in the bedrock and depositing coarse, angular gravel and sand in a stratified sequence. The location of these channels is shown on Plate 9. Outwash deposits underlie the Towns of East Aurora and Orchard Park.

(d) Glacial Lake Deposits

2.37 The surficial deposits in the north of the study area owe their origin largely to the existence of a succession of ice-dammed glacial lakes which covered this area between 13,000 and 11,000 years ago. In each lake, a bed of fine clays and silts (frequently laminated) was laid down while coarser debris brought in by tributary meltwater streams and north-flowing rivers accumulated near the shorelines. These are mapped as littoral sands and gravels on Plate 9. The contrast in composition between deep lake sediments and littoral sediments is demonstrated by Symecko (1967). A sample taken from well north in the lake plain contained 4 percent sand, 52 percent silt, and 41 percent clay. Samples containing 19 percent sand, 40 percent silt, and 41 percent clay, and 24 percent sand, 38 percent silt, and 38 percent clay, respectively, represent the progressive coarsening of sediment towards the strand lines marking the edges of the glacial lakes. The lake clays are typically soft, highly plastic with a high natural moisture content.

2.38 The glacial lakes developed semicontinuous beach ridges of fine and coarse gravel. These ridges cross the valley shoulders at a point 1/2 mile upstream from Spring Brook. The relevance of these ridges to the present study is their influence on lateral groundwater distribution and their presence on the abutments of possible dam sites. They might also serve as a source of pervious fill material for dam construction. These ridges have a present elevation of 760 feet and

Table 9

Drill Log
Water Well W10, East Aurora Water Works (See Plate 8 for location)

Number	Feet	Description
1	1 to 6	Topsoil muck.
2	6 to 48	Blue-grey clay. Very heavy, sandy near bottom with some gravel.
3	48 to 60	Coarse gravel, sand and clay. Well rounded stones 1/2" to 3" diameter.
4	60 to 70	Medium gravel and coarse sand. Finer gravel towards bottom.
5	70 to 92	Coarse gravel, sand and clay.
6	92 to 102	Coarse to fine gravel, sand and clay.
7	102 to 107	Clay, coarse gravel, sand.
8	107 to 123	Medium to fine gravel and sand.
9	123 to 127	Fine gravel mixed with much clay and sand.

are believed to originate from High Lake Warren and Low Lake Warren, both glacial lakes. Less continuous beach ridges 2 miles to the south, cross the Cazenovia valley at an elevation of 870 feet. These were deposited on the edge of the earlier glacial Lake Whittlesey.

(e) Recent Sediments

2.39 Postglacial processes that have modified the Cazenovia valley can be categorized as valley deepening from erosion, deposition of alluvium, and weathering of the valley sides.

2.40 Active downcutting through the bedrock shales and limestones has produced a typically rectangular valley profile with the stream flowing across exposed bedrock. The valley sides approach vertical where the river undercuts its banks. These cliffs are up to 100 feet in height. Sediment on the valley floor of the gorge section in Elma

is limited to an average thickness of less than five feet of flood-deposited coarse rounded cobbles and shaly gravel in those parts of the valley not traversed by the stream during period of normal flow.

2.41 Below West Seneca, the valley widens and alluvial deposits are are thicker (estimated to be in excess of 15 feet) with a larger proportion of sand and silt. At this point, the river flows off bedrock shale and the current slackens. Finer silts and clays were observed in the bed of the river one-half mile downstream from South-gate shopping plaza. The slower current contributes to the ice jamming problems in this reach.

2.42 Slope wash material has accumulated on the valley sides in the gorge. This is generally removed when the stream undercuts its banks, but in places the accumulation of weathered bedrock and glacial drift-derived debris is up to 50 feet thick. Colluvium 48 feet and 34 feet thick occurs in the left and right valley sides, respectively, at the site for a dam considered by the Corps of Engineers in 1963. This is shown in profile on Plate 10. Much of this material has been washed into the gorge from the drift-covered valley sides above. At this location, the drift is composed of clayey till overlain by gravelly beach deposits.

2.43 Soils

2.44 Soil scientists of the U. S. Department of Agriculture Soil Conservation Service (SCS) have mapped and described 12 different soil types located within and surrounding the floodprone West Seneca portion of the study area. Soil criteria such as depth, drainage, acidity or alkalinity, texture, slope, permeability, and stoniness, and water table height are among the factors considered in these descriptions. Plate 11, derived from aerial photos supplied by the East Aurora SCS office, is a survey map for the West Seneca area. Table 10 below gives a map reference and description for each soil type.

Table 10

Soils In West Seneca Area Of Cazenovia Creek Basin

Soil Map Number	Soil Name and Description
2	Hamlin Fine Sandy Loam - moderately well to well drained, slightly acid to neutral soils formed in alluvial deposits and dominated by silts and sands. Typically free of stones and gravel in upper 40 inches and very variable below, with some areas underlain by bedrock.

Table 10 (Cont'd)

Soils In West Seneca Area Of Cazenovia Creek Basin

Soil Map Number	Soil Name and Description
5	Teel Silt Loam - deep, moderately well to somewhat poorly drained, slightly acid to neutral soils formed in alluvial deposits derived mainly from limestone with some shale and sandstone influence. Coarse fragments range from 0 (most common) to 20 percent of substratum. Nearly level, found on floodplain where subject to springtime inundation. Consist of friable moderately permeable silt loam to fine sandy loam (24-40 in.) over friable, moderately permeable silt loam or fine sandy loam that may be gravelly.
7	Wayland Silt Loam - deep, poorly drained, neutral to mildly alkaline soils formed in neutral or calcareous recent alluvium. Occupy nearly level or depressed areas on floodplains receiving eroded matter from calcareous upland sources. Consist of moderately permeable silt loam or coarse silt clay loam (3-5 ft) over stratified alluvial sediment--sandy clay and gravel. Surface high in organic content.
8	Sloan Silt Loam - deep, poorly to very poorly drained, slightly acid to calcareous soils high in organic matter developed in alluvium. Occur on nearly level to depressional areas on stream floodplains. Composed of moderately permeable, coarse loam to coarse silty clay loam material.
9	Alluvium - undifferentiated soil formed in recent stream deposits with no soil condition dominant. Occupy nearby bar areas, accumulated in larger streambeds or in narrow strips along smaller streams. Permeability variable.
32	Canandaigua Silt Loam - deep, poorly or very poorly drained, slightly acid to neutral silty soils formed in calcareous glacial lake deposits. They occupy level areas or depressions. Consist of 1-1/2 to 3-1/2 feet of moderately permeable silt loam or very fine sandy loam over slightly permeable massive or platy water-sorted very fine sandy loam to coarse silty clay loam. The mucky silt loam soil consist of a silt loam surface 1-2 feet thick high in organic matter.

Table 10 (Cont'd)

Soils In West Seneca Area Of Cazenovia Creek Basin

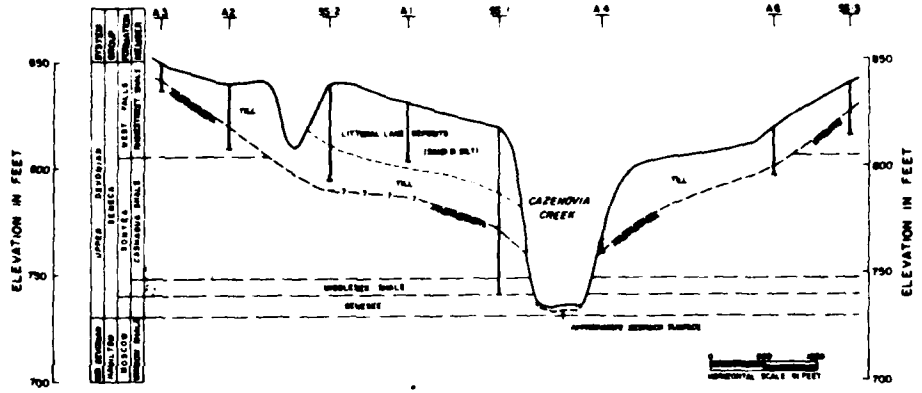
Soil Map Number	Soil Name and Description
34	Cayuga Silt Loam - deep, moderately well drained, slightly acid, developed in thin-layered lacustrine material over unsorted glacial till. Occupies undulating, rolling, and hill areas of till plains. Consist of less permeable silty clay loam on silty clay (24 to 42 in.) over medium or moderately fine textured calcareous glacial tills.
38	Collamer Silt Loam - deep, moderately well drained, strongly acid to neutral, stone-free silty soils formed in calcareous deposits of glacial lakes. Occupy gently sloping to moderately sloping topography. Consist of about 1 foot of moderately permeable silt loam over 1 to 2-1/2 feet of fine silt loam or coarse silty clay loam that is moderately permeable and is underlain by layers of silt with lenses of very fine sand and clay.
45	Niagara Silt Loam - deep, somewhat poorly drained, medium acid, silty soils developed in stratified, calcareous glacial lake deposits. Occupy nearly level to gently sloping parts of lake plains. Consist of about 1 foot of friable silt loam over 1-1/2 to 2 feet of moderately permeable silt loam material. The underlying material is friable, calcareous silt loam, with lenses of fine sand and clay.
48	Cosad Fine Sandy Loam - deep, somewhat poorly drained, strongly to slightly acid soils that formed in sandy lake sediments that overlie clayey lake-laid deposits. Typically free of stones. These nearly level to gently sloping soils are on low-lying to slightly depressional area of lake plains. Consist of 18 to 36 inches of very friable, moderately highly permeable, loamy fine sand or fine sand over very firm, very slowly permeable, calcareous silty clay loam to clay.
96	Angola Silt Loam - deep, somewhat poorly drained, neutral to moderately neutral to calcareous glacial till 20 to 40 inches over bedrock. Occupies nearly

Table 10 (Cont'd)

Soils In West Seneca Area Of Cazenovia Creek Basin

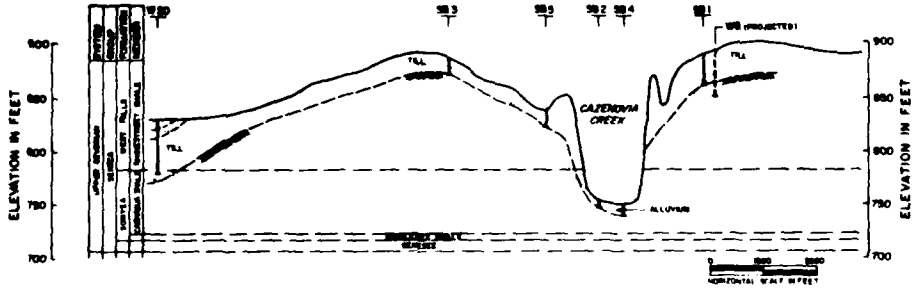
Soil Map Number	Soil Name and Description
96 (cont'd)	level to sloping areas on bedrock-controlled landforms. Consisting of moderately permeable silt loam (12 inches) very slightly permeable fine silt loam on coarse silty clay loam (12 to 14 in.) underlain by soft slightly acid or calcareous shale intergrading to hard limestone or sandstone in places.
112	Rock Outcrop - area of very shallow soils with fractured bedrock protruding above the surface in many areas.
245	Niagara Silt Loam - (substratum variant) - deep, somewhat poorly drained, medium acid, silty, developed in calcareous silty glacial lake deposits (40 to 60 in.) over glacial till. Occupies nearly level areas. Consists of friable silt loam (12 in.) over moderately permeable silt loam to silty clay loam material (18 to 24 in.). A thin layer of friable calcareous stratified silt and very fine sand to 24 inches rests on firm, dense, loamy glacial till.

2.45 Referring to the Soil Map, note that certain soil numbers are followed by a letter. The letters designate degree of slope in percent as follows: a = 0-3, b = 3-8, c = 8-15. Soil numbers lacking a slope letter are considered to be "a" slopes. Approximate depths to bedrock and seasonal water table for each soil type are listed in Table 11.



PROFILE A-A CENTERLINE SECTION ALONG AXIS OF SITE 2

NOTES: 1 BASED ON 1983 DRILLING PROGRAM BY U S CORPS OF ENGINEERS
2 BEDROCK DATA BUEHLER & TESMER (1983)
3 NO WATER TABLE OBSERVATIONS AVAILABLE



PROFILE B-B CENTERLINE SECTION ALONG AXIS OF SITE 1

NOTES: 1 BASED ON 1967 AUGER HOLES DRILLED BY HARZA ENGINEERING CO AND WELL RECORDS
2 BEDROCK DATA FROM BUEHLER & TESMER (1983)

LEGEND

WATER TABLE
BEDROCK SURFACE
GEOLOGICAL BOUNDARY

NOTE

REFER TO PLATE 8 FOR LOCATION OF SECTIONS

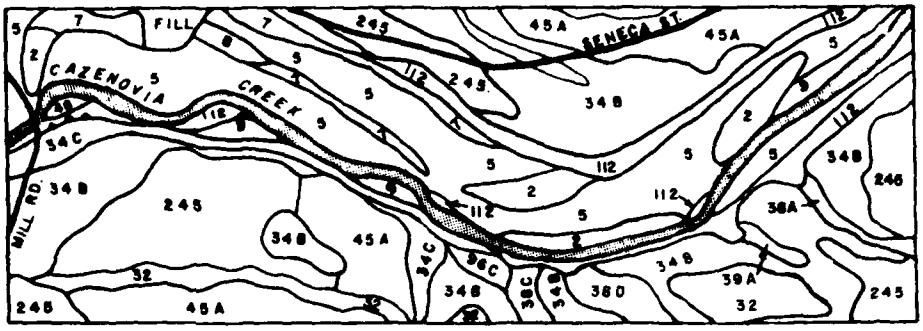
CAZENOVIA CREEK NEW YORK

VALLEY SECTIONS AT CONSIDERED DAM SITES

U S ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1974

PLATE 10



LEGEND:

2 HAMLIN FINE SANDY LOAM

5 TEEL SILT LOAM

7 WAYLAND SILT LOAM

8 SLOAN SILT LOAM

9 ALLUVIUM

32 CANANDAIGUA SILT LOAM

34 CAYUGA SILT LOAM

38 COLLAMER SILT LOAM

45 NIAGARA SILT LOAM

48 COSAD FINE SANDY LOAM

96 ANGOLA SILT LOAM

112 ROCK OUTCROP

245 NIAGARA SILT LOAM VARIANT

SLOPE DESIGNATIONS:

A 0-3 %

B 3-8 %

C 8-15 %

D 15-25 %

CAZENOVIA CREEK NEW YORK

SOILS SURVEY MAP

U.S ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1974

PLATE II

Table 11

Approximate Depths To Bedrock And Seasonal Water Table

Soil Number	Depth to Bedrock, ft.	Depth to Water Table, ft.
2	3 - 3.5+	1 - 1.5+
5	5+	1 - 2
7	5+ (usually >20)	0 - .5
8	10+	0
9	2 - 5	0 - .5
32	5+	0 - .5
38	4+ (usually >20)	1.5 - 3
45	5+	.5 - 1.5
48	5+	.5 - 1.5
96	2 - 3	.5 - 1.5
112	0 - 1	3+
245	5+	.5 - 1.5

2.46 Water Supply

2.47 The City of Buffalo obtains water from Lake Erie through an intake located near the head of the Niagara River. West Seneca, Orchard Park, and East Aurora receive their water from the Erie County Water Authority intake in Lake Erie in the Town of Hamburg. The remaining communities in the basin currently obtain their water supplies from wells and springs.

2.48 Groundwater behavior in the unconsolidated deposits of the study area is extremely variable and has been documented by the New York State Water Resources Commission (La Sala, 1968). The borehole records of 22 wells in the area are listed in Table 12 and locations shown on Plate 12.

2.49 Static water levels in overburden and bedrock are generally less than 20 feet below ground level, indicating that water loss by

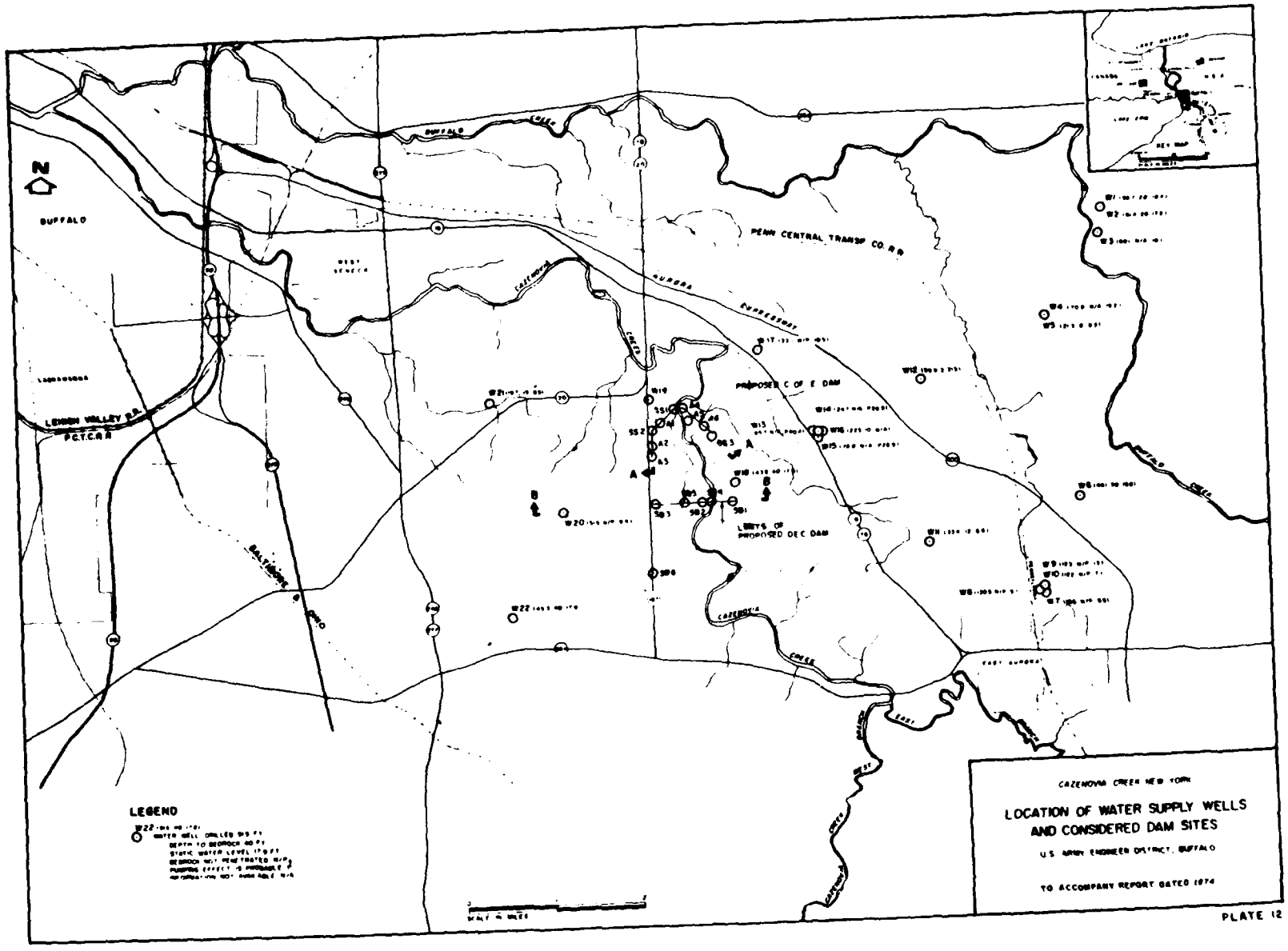

N
BUFFALO
PENN CENTRAL TRANSP CO. R.R.
LEHIGH VALLEY R.R.
P.C.T.C.R.R.
BALTIMORE & OHIO
PROPOSED C OF E DAM
LIMITS OF PROPOSED OEC DAM
CAZENOVIA CREEK
BUFFALO CREEK
LEGEND
CAZENOVIA CREEK NEW YORK
LOCATION OF WATER SUPPLY WELLS AND CONSIDERED DAM SITES
U.S. ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1974
PLATE 12

Table 12

Records of Water Wells In Cazenovia Basin (From La Sala, 1968)

Well No.	Year Completed	Type of Well	Depth of Well (ft)	Diameter (in)	Depth Bedrock (ft)	Water Bearing Mat'l.	Altitude Above Sea Level (ft)	Water Level Below Land Surface (ft)	Date	Estimated Pumpage of Flow (gpd)	Remarks
1	1960	Drl	50.7	6	a 20	Shale	845	16.4	7/30/63	100	
2	1959	Drl	61.4	6	a 20	Shale	845	17.2	7/30/63	300	
3	1964	Drl	60.1	6	-	Sand	840	10.0	7/8/64	-	
4	1960	Drl	70.9	10	-	Shale	920	19.2	7/31/63	200	
5	1955	Dug	21.3	36	8	Shale	920	9.3	7/31/63	200	
6	1961	Drl	46.1	6	a 30	Shale	860	15.8	7/30/63	250	
7	1934	Drl	r105	12	-	Sand & Gravel	895	r9.5	10/14/43	250,000	Pumping rate 500 gpm. Pumping test 690 gpm, swl 9.5' dd 46.5 ft.
8	1941	Drl	r130.5	16	-	Sand & Gravel	895	r5	1/13/42	260,000	Pumping rate 430 gpm. Pumping test 700 gpm, swl 5 ft. dd 102 ft.
9	1950	Drl	r123	12	-	Sand & Gravel	895	r13	10/11/51	-	Pumping test 420 gpm, swl 13 ft. dd 16.4 ft.
10	1961	Drl	r122	12	-	Sand & Gravel	895	r7	5/16/61	250,000	Pumping rate 490 gpm

Table 12 (Cont'd)

Records of Water Wells In Cazenovia Basin (From La Sala, 1968)

Well No.	Year Completed	Type of Well	Depth of Well (ft)	Diameter (in)	Depth Bedrock (ft)	Water Bearing Mat'l.	Altitude Above Sea Level (ft)	Water Level Below Land Surface (ft)	Date	Estimated Pumpage of Flow (gpd)	Remarks
11	1956	Drl	33.4	6	a 12	Shale	960	6.6	7/30/63	150	
12	1954	Drl	58.9	6	2	Shale	925	21.5	7/30/63	500	
13	1957	Drl	85.7	8	-	Shale	905	p40.4	9/23/63	n/a	
14	1957	Drl	24.7	12	-	Shale	910	p26.9	9/23/63	n/a	
15	1958	Drl	76.8	10	-	Shale	910	p26.9	9/23/63	n/a	
16	1962	Drl	r225	18	a 10	Shale	910	n/a	n/a	n/a	Yield 10 gpm
17	1961	Drl	22.1	6	-	Sand	830	10.5	7/26/63	250	
18	1960	Drl	43.8	6	a 40	Shale	770	17.9	7/26/63	200	Yield 3 gpm
19	No Record										
20	1959	Drl	51.5	7	-	Sand	830	9.4	7/26/63	250	
21	1959	Drl	19.7	6	a 15	Shale	740	8.5	7/26/63	250	Yield 5 gpm
22	1950	Drl	45.3	6	a 40	Sand & Gravel	830	17.9	7/26/63	100	Clay overlies water-bearing gravel

Abbreviations

dd = drawdown
swl = static water level
gpm = gallons per minute (U.S.)
Drl = drilled
r = reported
a = approximately
p = pumping effect is probable
n/a = not available

seepage from a reservoir located above Springbrook would be minimal. Overall water movements within the overburden are generally controlled by the gradient of the bedrock surface beneath, owing to the low permeability of this bedrock. A buried channel, filled with over 130 feet of coarse ice-contact deposits, north of East Aurora forms a natural groundwater reservoir from which four wells yield flows of from 500 to 800 gallons per minute (gpm); the highest yields in the Buffalo-Niagara Falls region. Recharge of these deposits from surface water is sufficient to maintain a static water level of approximately 10 feet below ground level, sufficiently high that the construction of a dam in Cazenovia valley with a crest line of up to a maximum elevation of 850 should not create seepage problems. However, if a reservoir in Cazenovia valley with an elevation greater than 800 feet were constructed, seepage through outwash deposits from this reservoir into the East Aurora groundwater reservoir could occur if induced by increased pumping from the wells north of East Aurora.

2.50 In general, permeability of sand and gravel deposits in the Buffalo-Niagara Falls area is such that six-inch wells yield from 3 to 450 gpm with yields in the 10-35 gpm range most common. In contrast, permeability of the glacial till and lake bottom sediments is so low as to yield no water to wells (La Sala, 1968).

2.51 Yields of wells in all shale formations above the Onondaga Limestone are generally low, ranging from 1 gpm to about 40 gpm. The fracture zone at the bedrock surface may extend as deeply as 10 feet into the shale, in which case this horizon, combines with overlying glacial deposits (which may be coarse-grained at the base) acts as a local aquifer. The shale at this depth, therefore, has a much lower permeability than the fracture zone at the top of the shale, since vertical joints are generally only of hairline width.

2.52 The sand and gravel beach ridge deposits have a local distributive effect on groundwater, acting as near-surface drains. They are oriented at right angles to the general flow of groundwater outside the immediate influence of the Cazenovia Creek valley, and observations by the Soil Conservation Service show that a seepage line exists along the northwesterly margin of these ridges.

2.53 Water Quality In Cazenovia Creek

2.54 The most comprehensive set of data on Cazenovia Creek water quality is that assembled by the Erie County Laboratory, Public Health Division, presented in Tables 13, 14 and 15. Note these data were drawn from samples collected during the summers of 1970, 1971, and 1973, during normal working hours, with no attempt made to correlate sampling with time of day. Samples were taken during the summer months of June, July and August, and were collected approximately three times per week

Table 13

Cazenovia Creek Water Quality, West Branch

Sta. #	BOD 5,20 ppm O_2			Dissolved O_2 ppm					O_2 Saturation %			Total Phosphate ppm			Nitrate ppm		Fecal Coliform per 100 ml		
	Yr. 70	71	73	70		71		73	70	71	73	70	71	73	70	71	70	71	73
				min	mean		min	mean											
CZW1	1.3	1.3	1.8	7.3	9.0	9.2	7.7	8.4	101	110	97	.04	<.005	.06	1.60	.39	401	< 2	222
CZW2	1.1	1.0	-	7.4	8.7	8.8	-	-	94	104	-	.04	.005	-	1.40	.48	508	< 2	-
CZW3	.9	1.6	-	7.8	8.6	9.8	-	-	94	116	-	.08	.07	-	2.00	.48	737	2	
CZW4	.9	1.3	-	7.9	9.1	9.9	-	-	104	106	-	.04	.005	-	1.20	.48	603	<10	-
CZW5	.9	1.3	-	8.3	9.4	10.5	-	-	107	114	-	.03	.02	-	1.20	.52	159	8	
CZW6	.9	1.4	-	8.6	9.3	9.0	-	-	102	90	-	.02	.01	-	5.80	1.40	192	< 2	

For station locations, see Plates 13, 14 and 15.

Table 14

Cazenovia Creek Water Quality, East Branch

Sta. #	$BOD_{5,20}$ ppm O_2			Dissolved O_2 ppm						O_2 Saturation %			Total Phosphate ppm			Nitrate ppm		Fecal Coliform per 100 ml		
	Yr. 70	71	73	70		71		73		70	71	73	70	71	73	70	71	70	71	73
				min	mean		min	mean												
CZE1	2.2	-	-	6.5	8.8	-	-	-		98	-	-	.67	-	-	8.70	-	2591	-	144
CZE2	-	.7	-	-	-	8.8	-	-		-	104	-	-	.02	-	-	.15	-	236	-
CZE3	1.4	.7	1.5	6.0	7.2	7.8	5.0	6.6		80	90	76	.14	.02	0.10	3.00	.15	340	241	184
CZE4	.8	.7	-	7.3	8.4	10.1	-	-		88	120	-	.06	.005	-	2.90	.15	1871	90	-
CZE5	1.1	1.2	1.2	7.8	8.9	11.5	8.5	9.3		95	134	105	.07	.005	0.04	2.40	.15	229	201	577
CZE6	1.6	1.6	-	7.5	9.0	10.3	-	-		98	118	-	.08	.005	-	2.20	.41	5974	3100	-
CZE7	1.5	1.1	1.6	-	-	9.5	8.0	8.8		106	108	102	.05	.005	0.12	2.10	.39	75	75	47

For station locations, see Plates 13, 14 and 15.

Table 15

Cazenovia Creek Water Quality, Main Stream

Sta. #	$BOD_{5,20}$ ppm O_2			Dissolved O_2 ppm					O_2 Saturation %			Total Phosphate ppm			Nitrate ppm		Fecal Coliform per 100 ml		
	Yr. 70	71	73	70		71		73	70	71	73	70	71	73	70	71	70	71	73
				min	mean		min	mean											
CZ1	2.1	2.5	-	7.0	9.5	8.0	-	-	113	92	-	.22	.13	-	2.80	.55	208	-	-
CZ2	2.6	2.4	-	6.3	9.4	10.8	-	-	105	128	-	.20	.13	-	2.70	.64	338	-	-
CZ3	2.8	2.2	-	5.8	10.4	12.1	-	-	128	143	-	.29	.10	-	3.00	.82	2700	-	-
CZ4	2.1	2.6	-	7.2	10.6	9.5	-	-	131	117	-	.27	.25	-	2.40	.52	134	-	-
CZ5	3.2	4.9	1.7	7.5	11.0	-	7.3	10.3	137	-	118	.29	.60	0.17	3.30	.52	122	-	166
CZ6	1.2	2.2	-	7.4	8.9	9.5	-	-	98	108	-	.29	.70	-	3.60	1.22	1488	-	-

For station locations, see Plates 13, 14 and 15.

during 1970 summer months and on a weekly basis in 1973 summer months. Hence, although this study provides very valuable information, the results might reflect conditions occurring only during daylight hours of the summer. Effects on stream condition due to seasonal and diurnal (24 hrs.) variations were not ascertained during this study.

2.55 Parameters of water quality are discussed below in detail, followed by a review of the major biota and a summary of the creek environment in its present state. Because proposed flood control alternatives would have their greatest impact on the main stream, that reach has received the most thorough attention.

2.56 Temperature

2.57 The main stream lies in a broad channel exposed to sun and wind, even where it flows through a gorge. Because of its low flow, broad expanse, and lack of cover, the creek is assumed to be near and seldom below ambient air temperature by early afternoon. On clear sunny days, creek temperatures might possibly exceed ambient air temperatures due to surficial heating and back radiation from underlying bedrock.

2.58 Dissolved Oxygen

2.59 Dissolved oxygen (DO) is considered a primary water quality parameter, influencing the occurrence and vigor of stream life and determining the extent and degree of many complex biochemical reactions. The stauration level of O_2 in solution is inversely proportional to water temperature. The actual concentration of DO in a body of water is controlled by temperature, surface area, exposure to wind, turbulence, biological and chemical demand, and photosynthesis.

2.60 Dissolved O_2 in streams commonly ranges from 0 to 13 ppm depending on temperature, although much higher levels are possible under supersaturated conditions. The O_2 requirements of stream life vary. Some forms are capable of obtaining atmospheric O_2 and are thus independent of DO levels (although their food supply may not be). Others have developed highly efficient respiratory physiologies, enabling them to exist under low oxygen conditions (2 to 4 ppm). At the other extreme are fish such as trout, which require cold water with a dissolved O_2 content of at least 5 ppm and preferably higher.

2.61 Whatever their specific needs, most organisms are ultimately sensitive to oxygen concentration. Below limiting values, reproduction and ultimately survival are threatened. In this respect, the averaging of DO data can yield misleading results--any drop in DO below threshold limits, occurring even briefly, could kill organisms capable of living at the calculated mean levels. Benthic organisms which for the most part are either slow moving or sessile and unable to escape local

conditions are especially vulnerable to O_2 minima. This point is stressed because large diurnal fluctuations in DO concentration are common in waters supporting heavy growths of algae or rooted aquatic vegetation. Here nightly DO depletion occurs due to respiratory demands no longer balanced by photosynthetic O_2 production.

2.62 Available data indicate that Cazenovia Creek is well oxygenated throughout its course, with a minimum summer daytime concentration of 5.8 ppm O_2 in the main stream. The supersaturated conditions (100%) noted along much of the creek are often indicative of quiescent flow--turbulence (as associated with a riffle area) would cause the release of excess O_2 to the atmosphere. Although data is lacking, such supersaturated conditions may be due to daytime photosynthetic O_2 production or rapid temperature changes. Although supporting information is unavailable, the relative degree of diurnal DO fluctuation can be estimated. In very shallow sections or where velocities are high enough so that streamflow direction may be discerned, nightly O_2 depletion is likely to be minimal. Much of the stream fits this description. However, in those few reaches where flow is excessively sluggish and where relatively deep pools or channels harbor luxuriant algal growths, nightly depletion might well play a major role in the local ecology. It should be emphasized that these reaches are the exception rather than the rule, and for much of the stream the prevalent open, shallow conditions favor atmospheric aeration which maintains dissolved O_2 at or above the saturation level.

2.63 Organic Matter and Oxygen Demand

2.64 Organic matter may originate in a stream (remains of plant and animal life) or enter it from outside (sewage effluents, overhanging vegetation, etc.). High concentrations of organic matter support rich growths of microbial life which depletes the stream's supply of dissolved O_2. The Biochemical Oxygen Demand (BOD) is a measure of the organic matter assimilable by stream organisms. BOD is conventionally expressed in terms of milligrams per liter (mg/l) O_2 utilized over a five-day period by microorganisms in a sample of water incubated in the dark at some standard temperature (usually 20° C). "Pure" natural waters exhibit BOD's of up to 5 mg/l, while raw sewage effluents often exhibit BOD's as high as 300 mg/l (Mackenthun, 1969).

2.65 BOD values at points along Cazenovia Creek are given in Tables 13, 14 and 15. During the sampling period, the BOD did not exceed 5 mg/l anywhere, even near the hamlets of Holland and West Falls, where small sewage treatment plants discharge into the stream (refer to Table 16 for a complete listing of effluent contributors). Organic loading is not a serious problem on Cazenovia Creek at the present time, although it could quickly become one as creek frontage is encroached upon by residential and commercial development. The creek ecosystem has the capacity to degrade, assimilate, and disperse existing organic loads within a short diatance from their source.

2.66 Dissolved Inorganic Matter and pH

2.67 An extensive survey of the inorganic chemistry of area streams, a portion of which is reproduced herein, was published in 1968 by the Erie-Niagara Basin Regional Water Resources Planning Board. Results of water quality analyses for Cazenovia Creek, completed through a range of discharge conditions, are tabulated in Table 17. Table 18 explains the significance of the individual substances and gives, where applicable, the maximum allowable according to Federal drinking water standards. Referencing data to streamflow as done here is critical. During periods of low flow, the creek contains predominantly groundwater which has percolated through soil and rock layers, leaching out soluble components. Under high flow conditions this mineralized water is diluted by overland runoff, an effect dramatically illustrated in this study.

2.68 The dominant chemical characteristics of Cazenovia Creek water in 1968 were hardness, alkaline pH (greater than 7.0) and moderate mineral content (dissolved soilds). These characteristics reflect the calcareous nature of the bedrock in the stream basin. It is therefore unlikely that the chemical characteristics have changed much during the six-year interim, or will in the foreseeable future. The effect of urbanization in the basin on other chemical parameters is unknown, except for chlorides, which were sampled very near the 1968 study sites in 1970 and 1971 by the Erie County Public Health Division. Comparison of the results in Table 19, reveals a marked upward trend in chloride concentration over the years. These increases could be due to a number of factors including salt runoff from highway deicing operations and industrial or municipal discharges, but at present speculation would be premature.

Table 16

Sanitary Discharges Into Cazenovia Creek

Miles from Mouth	Town or Village	Nature or Source of Discharge	Miles from Confluence of E. & W. Branches	Town or Village	Nature or Source of Discharge
		Main Stream		East Branch	
7.2	W. Seneca	W. Seneca State School untreated	1.2	E. Aurora	E. Aurora Sewage Treatment Plant
11.2	Elma	Moog Valve Plant disch.	5.6	Aurora	Aurora Trailer Court
15.6	Aurora	St. John Vianney Seminary	8.3	Aurora	Gow School
			9.0	Wales	Creekside Trailer Court
		Tannery Brook	13.4	Holland	
3.9	Wales	Circle Cts. (apts.)	13.7	Holland	Holland Central School
			14.1	Holland	Town Sewage Treatment Plant
				West Branch	
			5.6	W. Falls	Town Treatment Plant
			10.5	Colden	
			13.0	Glenwood	
			14.0	Glenwood	Glenwood Acres Disch.
			14.0	Concord	Craneridge Subdivision
			14.2	Concord	Kissing Bridge Disch.

Table 17

Inorganic Chemistry of Cazenovia Creek

Source: Erie-Niagara Basin Chemical Quality of Streams (1968)
By Erie-Niagara Basin Regional Water Resources Planning Board

Location → / Parameter ↓	Main Stream At Ebenezer Gauge					East Branch South Wales			West Branch East Aurora		
Instantaneous Discharge cfs	24	31	81	10	158	29	5.3	83	42	4.9	--
Silica (SiO_2)	2.6	3.6	.3	3.9	--	1.9	6.3	--	.7	3.8	--
Iron (Fe)	.07	.15	.11	.06	.12	.05	.03	.08	.03	.16	.05
Manganese (Mn)	--	0	0	.02	.07	0	0	.16	0	.02	.03
Calcium (Ca)	42	51	46	58	36	36	45	27	36	49	28
Magnesium (Mg)	10	11	9.2	11	6.4	7.5	8.0	5.6	6.6	9.1	5.0
Sodium (Na)	15	13	19	28	12	6.0	7.1	5.4	6.1	8.7	5.1
Potassium (K)	2.0	3.1	2.0	3.5	1.4	1.3	1.8	1.2	1.5	2.2	1.2
Bicarbonate (HCO_3)	104	135	120	111	88	100	131	72	92	124	70
Sulfate (SO_4)	51	58	47	69	36	34	38	28	39	60	30

Table 17 (Cont'd)

Inorganic Chemistry of Cazenovia Creek

Location → / Parameter ↓	Main Stream At Ebenezer Gauge					East Branch South Wales			West Branch East Aurora		
Instantaneous Discharge cfs	24	31	81	10	158	29	5.3	83	42	4.9	--
Chloride (Cl)	28	20	32	48	20	11	12	9.1	12	14	9.0
Fluoride (F)	.2	.1	.1	.1	--	1.0	0	--	.1	.1	--
Dissolved Solids at 180°C	234	235	220	796	181	154	199	127	153	214	129
Hardness Ca, as $CaCO_3$ Mg	146	173	153	190	116	121	146	90	117	160	90
Non-Carbonate	60	62	55	72	44	39	38	32	42	59	33
Specific Conductance umphos at 25°C	362	395	398	491	293	273	330	214	267	352	213
pH (units)	7.3	8.2	8.0	8.8	7.9	7.8	7.3	8.1	7.6	7.6	8.0
Alkyl Benzene Sulfonate (PBS)	--	--	0	.1	--	0	0	--	0	0	--

Note: All units ppm unless otherwise stated.

Table 18

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Source: Erie-Niagara Basin Chemical Quality of Streams (1968) - E-NBRWRPB

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Alkyl benzene sulfonate (ABS)	Synthetic detergents in domestic, and industrial wastes.	Causes tastes and odors, and causes foam on streams and in treatment plants. Treatment somewhat difficult and generally incomplete.	0.0-.4	0.0-.2	0.5
Bicarbonate (HCO_3) Carbonate (CO_3)	Action of carbon dioxide in water on carbonate cementing material and rocks, such as limestone and dolomite.	Produces alkalinity. On heating in the presence of calcium and magnesium can form scales in pipes and release corrosive carbon dioxide gas. Aid in coagulation for the removal of suspended matter from water.	HCO_3 91-180 CO_3 0	150-230 0	—
Calcium (Ca), Magnesium (Mg)	Dissolved from practically all soils and rocks, but especially from limestone, dolomite, and gypsum.	Causes most of the hardness and scale-forming properties of water; detergent consuming (see hardness). Water low in calcium and magnesium desired in electroplating, tanning, dyeing, and in textile manufacturing. Small amounts desirable to prevent corrosion.	Ca 32-58 Mg 6-12	58-160 11-22	—
Chloride (Cl)	Dissolved from rocks and soils. Present in sewage and industrial wastes.	Some people can detect salty taste in concentrations exceeding 100 ppm. Large quantities increases the corrosiveness of water. Present available treatment methods not generally economical for most uses.	6-22	19-71	250

Table 18 (Cont'd)

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Color	Decaying vegetation; peat, leaves, roots and other organic substances, industrial wastes and sewage and certain minerals.	Water for domestic and some industrial uses should be free from perceptible color. Color in water is objectionable in food and beverage processing and many manufacturing processes.	3-9	6-26	--
Dissolved Solids (residue on evaporation)	Chiefly mineral constituents dissolved from rocks and soils. Includes some water of crystallization.	Waters containing more than 1,000 ppm of dissolved solids are unsuitable for many purposes.	140-240	260-720	500
Fluoride (F)	Dissolved in small to minute quantities from most rocks and soils. Added to many waters by fluoridation of public supplies.	Fluoride concentrations between 0.8 and 1.5 ppm accepted as range for beneficial effect on the structure and resistance to decay of children's teeth in study area as based on the average annual daily maximum temperature of 56.3°F at Buffalo (Johnson, 1960, p.11). Fluoride in excess of 6.0 ppm causes pronounced mottling and disfiguration of teeth.	0.0-.2	0.2-.4	--
Hardness as $CaCO_3$	In most waters nearly all hardness due to calcium and magnesium.	Consumes soap and synthetic detergents. Although less of a factor with synthetic detergents than with soap, it is still economical to soften hard waters (Aultman, 1958).	100-190	190-490	--

Table 18 (Cont'd)

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Hydrogen ion, concentration (pH)	Hydrogen ion concentration	A pH of 7.0 indicates neutrality of a solution. Values higher than 7.0 denote increased alkalinity; values higher than 7.0 indicate increased acidity. Corrosiveness of water generally increased with decreasing pH, but excessively alkaline waters may also attack metals.	7.3-8.1	7.2-8.0	--
Iron (Fe)	Dissolved from practically all rocks and soils. Found in some industrial wastes. Can be corroded from iron pipes, pumps and other equipment.	More than 0.1 ppm often precipitates on exposure to air, causing turbidity, staining and tastes and colors which are objectionable in food, beverage, textile processes and ice manufacturers as well as the cause of problems in domestic use such as staining plumbing fixtures and laundry.	0.03-.19	0.05-.19	0.3
Manganese (Mn)	Dissolved from some rocks, soils, and lake bottom sediments. Sources associated with that of Iron.	Same objectionable features as Iron. Causes dark brown or black stains. Manganese removal associated with that of Iron but more difficult and generally less complete.	0.00-.03	0.01-.17	.05
Nitrate (NO_3)	Decaying organic matter, sewage, fertilizers and nitrates in soils.	Small amounts of nitrate help reduce cracking of high-pressure boiler steel. It encourages growth of algae and other organisms which produce undesirable taste and odors. Concentrations in excess of 45 ppm limit are suspected as cause of methemoglobinemia in infants.	0.4-4.6	0.6-3.5	45

Table 18 (Cont'd)

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Silica (SiO_2)	Dissolved from practically all rocks and soils.	Together with calcium and magnesium, silica forms a low-heat conducting hard glassy scale in boilers and turbines. Silica inhibits deterioration of zeolite-type water softeners and corrosion of Iron pipes by soft water.	1-6	1-7	--
Sodium (Na), Potassium (K)	Dissolved from practically all rocks and soils. Found in industrial wastes and sewage.	More than 50 ppm sodium and potassium in the presence of suspended matter causes foam in boilers which accelerates scale formation and corrosion. More than 65 ppm of sodium can cause problems in ice manufacture. (Durfor and Becker, 1964a, p. 17)	Na 3-12 K 1-3	9-30 2-4	--
Specific Conductance	Mineral content of the water.	Guide to mineral content. It is a measure of the capacity of the water to conduct a current of electricity, and varies with the concentration and degree of lonization of the different minerals in solution.	230-420	420-1,000	--
Sulfate (SO_4)	Dissolved from rocks and soils containing gypsum, sulfides, and other sulfur compounds. May be derived from industrial wastes, both liquid and atmospheric.	Sulfate in water containing calcium forms hard scale in steam boilers. In large amounts, sulfate in combination with other ions gives bitter taste to water. Some calcium sulfate is considered beneficial in brewing processes.	22-55	40-350	250

Table 18 (Cont'd)

Source or Cause and Significance of Dissolved Mineral Constituents and Properties of Water as Related to the Erie-Niagara Basin

Constituent or property	Source or cause	Significance	Concentration (ppm) values commonly found in streams in the Erie-Niagara basin (except at times of very low or very high flow)		Federal drinking water standards 1/ (parts per mil.)
			Entire area except lower Tonawanda Creek Basin	Lower Tonawanda Creek Basin	
Turbidity	Suspended and colloidal matter. Sources can be soil erosion, industrial wastes, micro-organisms.	Turbid water aesthetically objectionable. Also, objectionable in many industrial processes; generally removed by sedimentation, clarification or filtration.	0.0-.7	0.2-.7	--

1/ U.S. Public Health Service (1962).

Table 19

Chloride Concentration in Cazenovia Creek, PPM

Location	1968			1970			1971		
	max	min	mean	max	min	mean	max	min	mean
Main Stream	48	20	30	300	10	102	NA	NA	150
E. Branch	12	9	11	23	8	18	NA	NA	100
W. Branch	14	9	12	73	8	26	NA	NA	75

2.69 Nitrates and Phosphates

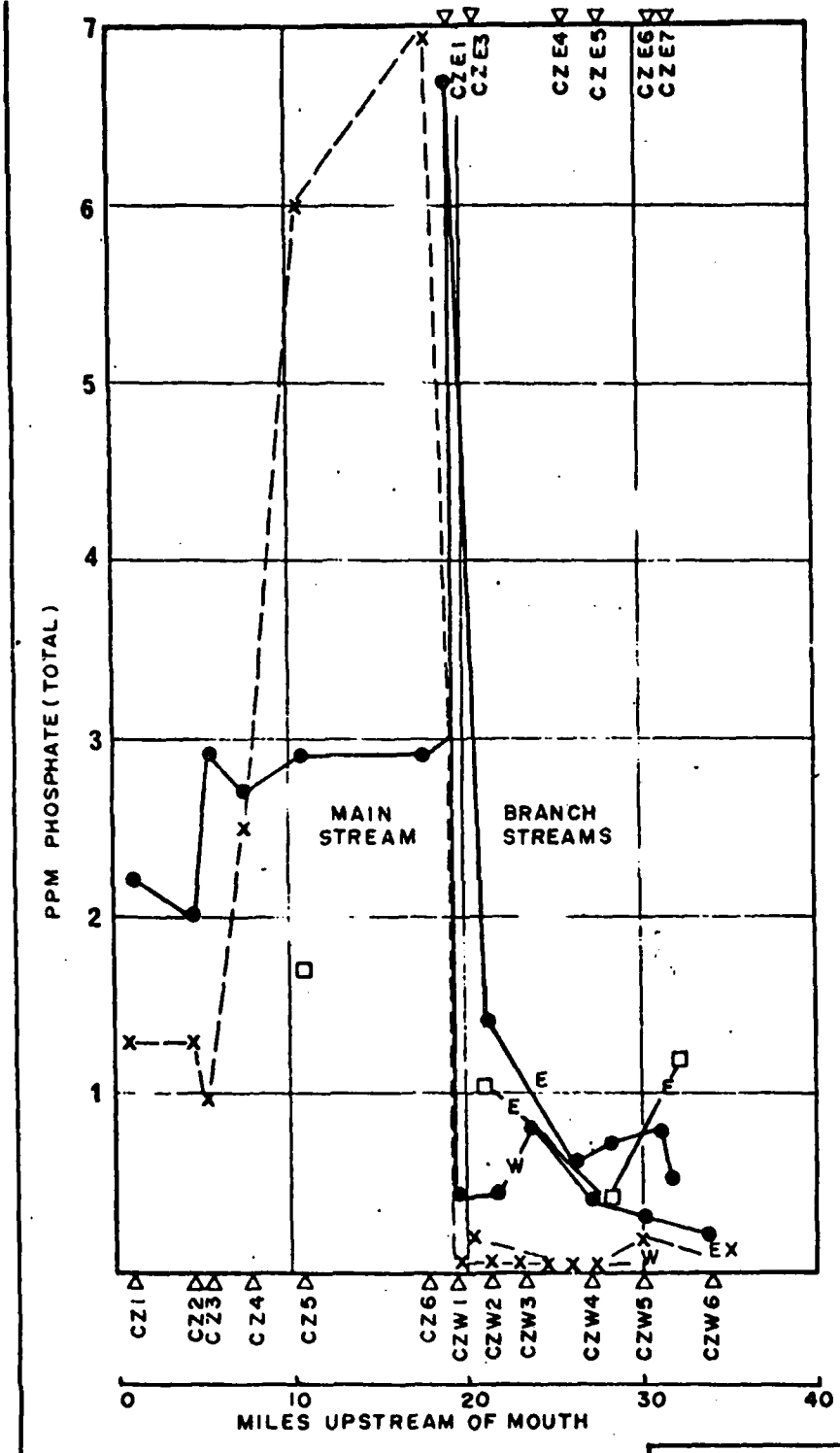
2.70 Nitrates and phosphates are usually considered among the most critical nutrient substances entering aquatic ecosystems. In many cases, the concentration of nitrate or phosphate determines primary productivity, the capacity of an ecosystem to convert radiant energy and inorganic substances into living protoplasm (biomass). Under proper conditions, nutrient levels as low as 0.2 mg/l nitrate and 0.01 mg/l phosphate promote luxuriant growths of producer organisms (photosynthetic algae and macrophytes) which in turn support large populations of grazing and predatory organisms (MacKenthum, Ruttner). Note, however, that regardless of nitrate or phosphate level, if other conditions (water velocity, temperature, metal ion levels, etc.) are unfavorable to the survival of producer populations, they will not flourish and productivity will be low.

2.71 Much of the drainage basin for Cazenovia Creek system consists of woodland and agricultural land. It is possible that fertilizer enriched runoff from some of these lands and sewage effluent discharges may contribute to the nutrient content in the creek. Available water quality data (Tables 13, 14 and 15; Plates 13 and 14) seem to indicate a marked decrease in phosphates and nitrates between study periods. However, as discussed in the intorduction to the Water Quality section these data might not reflect seasonal and diurnal variations. Therefore, a meaningful analysis of the apparent decrease in phosphates and nitrates is impossible at this time.

2.72 The available data do suggest certain general trends, however, the main stream appears to be the most nutrient-laden branch, especially with respect to phosphate. Most of the creek experiences nitrate concentrations well above limits critical to primary productivity. It is quite possible these nutrients are underutilized; that due to physical or geological shortcomings (shallowness, poor substrate), the creek is unable to support a level of productivity otherwise sustainable by ambient nutrient levels. This consideration is of prime concern in the assessment of any flood control alternative which would create conditions more favorable to algal growth, such as a reservoir.

2.73 Sanitary Quality and Stream Rating

2.74 Sanitary quality of stream water is most often measured by determining the abundance of fecal coliforms - bacteria associated with feces of warm-blooded mammals. Mean fecal coliform counts in Cazenovia Creek, expressed in terms of bacteria per 100 ml of water are given in Tables 13, 14 and 15, and graphically in Plate 15. The U.S. Department of Health states that waters with suitably determined mean fecal coliform counts of greater than 1 per ml are unfit for human consumption, while the U.S. Department of the Interior states



LEGEND:

'70

X---X '71

'73.

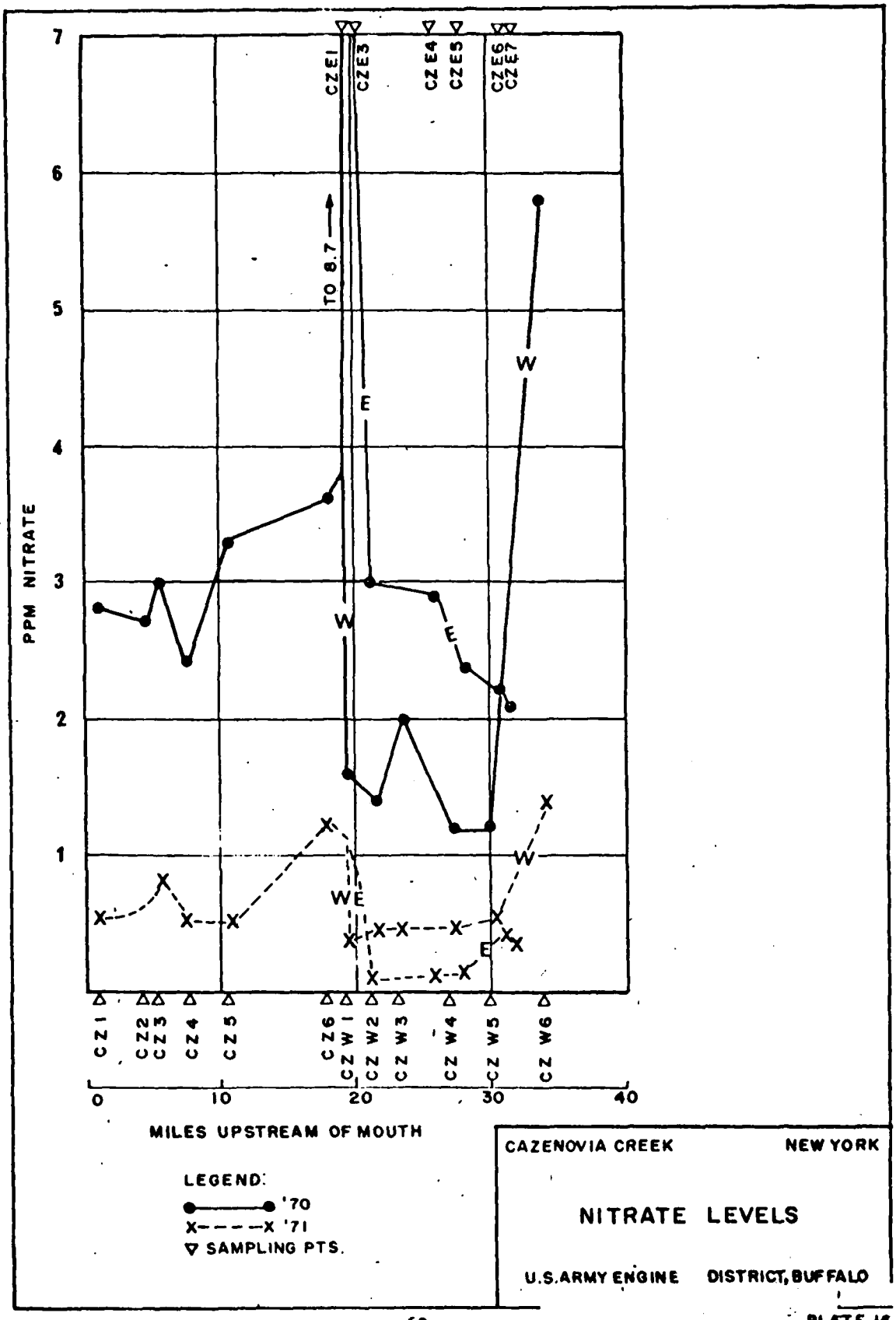
△ SAMPLING PTS.

CAZENOVIA CREEK NEW YORK

PHOSPHATE LEVELS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 13


PPM NITRATE
7
6
5
4
3
2
1
CZE1
CZE3
CZE4
CZE5
CZE6
CZE7
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CZ3
CZ4
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CZ6
CZ W1
CZ W2
CZ W3
CZ W4
CZ W5
CZ W6
0
10
20
30
40
MILES UPSTREAM OF MOUTH
LEGEND:
'70
'71
SAMPLING PTS.
CAZENOVIA CREEK
NEW YORK
NITRATE LEVELS
U.S.ARMY ENGINE DISTRICT, BUFFALO
PLATE 14

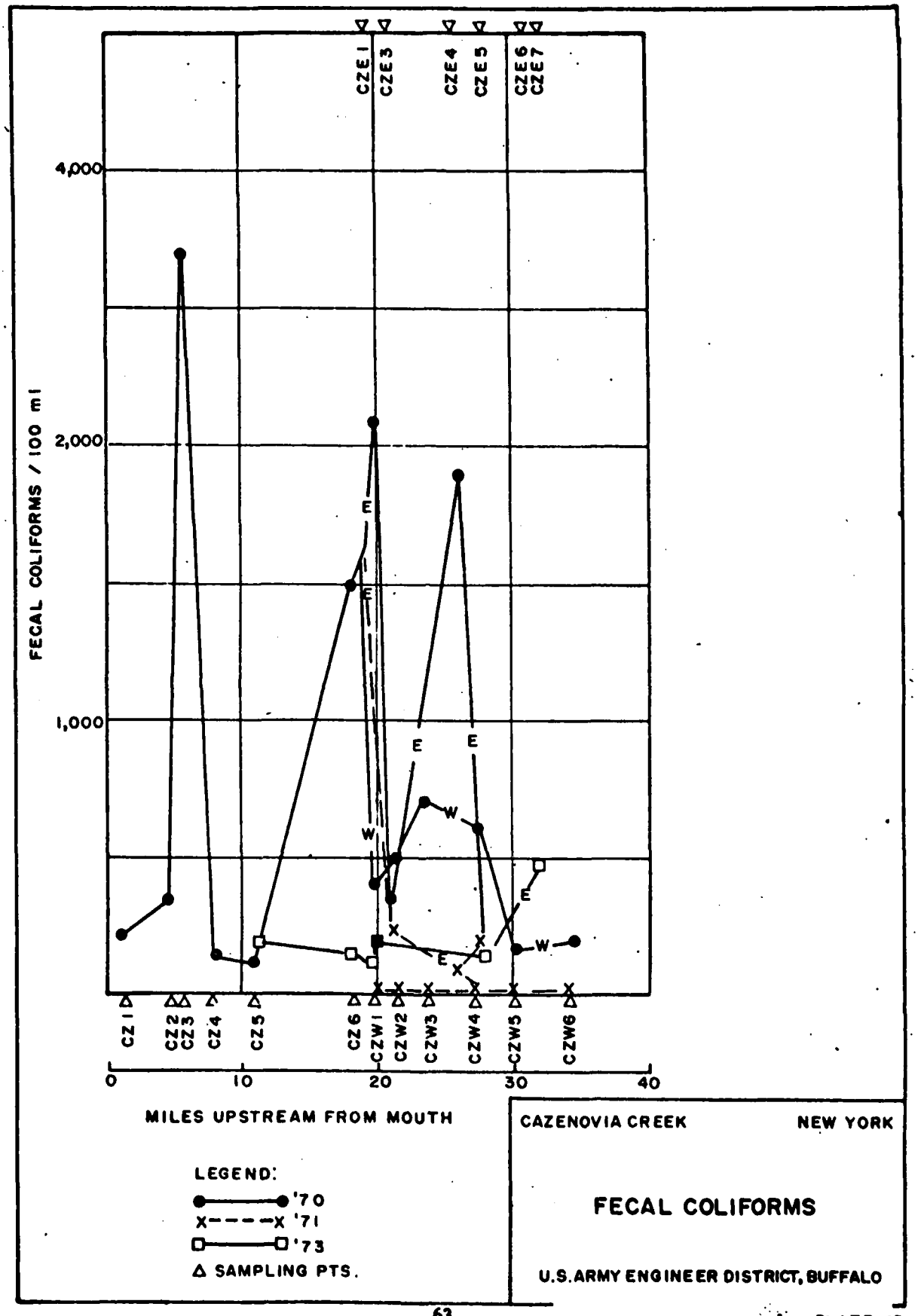
CZE1
CZE3
CZE4
CZE5
CZE6
CZE7
4,000
2,000
1,000
FECAL COLIFORMS / 100 ml
E
W
X
CZ1
CZ2
CZ3
CZ4
CZ5
CZ6
CZW1
CZW2
CZW3
CZW4
CZW5
CZW6
0
10
20
30
40
MILES UPSTREAM FROM MOUTH
LEGEND:
'70
X '71
'73
SAMPLING PTS.
CAZENOVIA CREEK
NEW YORK
FECAL COLIFORMS
U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 15

that waters with greater than 200 per 100 ml are unfit for extensive body contact. According to these standards, Cazenovia Creek is largely unsuitable even for swimming despite a New York State Classification as a B stream (bathing permitted) throughout much of its length. Note, however, that New York State standards do not consider coliform content in determining a Class B rating.

2.75 The sanitary quality of Cazenovia Creek is much higher than some local public beaches and equal to that of the Niagara River at Beaver Island State Park, one of the most popular beaches in the area. Mean coliform counts on Cazenovia Creek during 1973 were 242 as compared to 237 at Beaver Island.

2.76 Stream Biota

2.77 Aquatic Plant Life

2.78 Available data on the aquatic plant life of Cazenovia Creek is rather sparse. The 1973 Erie County Stream Survey, by the Erie County Dept. of Health, conducted from 19 June to 3 October 1973, notes the more common plants observed in Ellicott Creek during their intensive water quality study. The bottom of Cazenovia Creek varies from sand, gravel, and large stones to clay and some humus. Few deposits of muck or organic debris were noted. Totally submerged aquatic plants included (Elodea canadensis and Myriophyllum heterophyllum). Seen floating on the water surface were Duckweek (Lemna minor). A frequent emergent was Arrowhead (Sagittaria latifolia). *Filamentous* algae include Cladophora, dominant at all stations and Spriogyra, Hydrodictyon, Zygnema, and Mougeoteria. Diatoms observed at the Center Street Bridge in Aurora were Cymbella and Navicular.

2.79 Benthic Invertebrates

2.80 Benthic or bottom-dwelling organisms constitute an integral part of the stream food chain. Many, such as mayfly nymphs, are primary consumers feeding directly on aquatic plant life. Some, including a variety of larval insect forms, are secondary consumers, carnivores actively preying upon other animal life. Others such as the pollution-tolerant Tubifex worms are detritovores, grazing on bacteria associated with decaying organic debris.

2.81 Benthic invertebrates of Cazenovia Creek are listed in Table 20 in order of abundance, based upon collections gathered by the Sanitary Biology section of the County Public Health Division during the summers of 1970, 1971 and 1973. Note that Tendipes is a dominant organism in all reaches of the stream, reflecting its tolerance of a wide range of conditions. Tubifex worms are abundant only in highly restricted locales immediately downstream of sewage effluents. Even here, however, forms such as mayfly nymphs with high O_2 requirements are common, indicating the effectiveness of atmospheric aeration. The main stream community appears dominated by organisms favoring pool rather than stream habitats.

2.82 Little information is available concerning the benthic microfauna of Cazenovia Creek. Large populations of sessile rotifers and protozoans are to be expected wherever benthic algae occur. It is impossible here to assess the impact of this community on overall stream metabolism. Certainly, the nutrient supply is more than adequate, and the physiographic characteristics which limit larger forms would have little effect on these microscopic organisms.

2.83 Fish

2.84 Fish inhabiting Cazenovia Creek are of interest to local residents as a potential source of recreational pleasure. However, the creek in its present natural state is a poor source of game and pan fish. Surveys taken during the summers of 1956 and 1967 by N.Y.S. Dept. of Environmental Conservation personnel of the Scottsville, NY, office reveal that of the 20 odd species of fish in the main stream, 10 are minnows. Of these, by far the most abundant are the common shiner (Notropis cornutus) and the stoneroller (Campostoma anomalum). The most numerous large fish are the suckers Hypentelium nigricans and Catostomus commersoni. The highly desirable Centrarchids (bass, sunfish, etc.) are found sporadically, while trout are found only in the upper East Branch above Holland. Table 21 lists fish species known to inhabit Cazenovia Creek below the confluence of the East and West Branches. No endangered fish species are known to inhabit Cazenovia Creek.

2.85 In a 1967 study of fish and wildlife in the Erie-Niagara Basin, the State Department of Environmental Conservation (DEC) characterized Cazenovia Creek as a low-potential fishery resource. Public access is limited due to extensive posting. Furthermore, the DEC concluded that cold-water game fish such as trout are limited by high temperature, unsuitable streambed, and lack of cover; while warm-water fish such as bass are limited by extreme overall shallowness and concomitant absence of large deep pools.

2.86 Terrestrial Biota

2.87 Vegetation

2.88 Along Cazenovia Creek, wherever soil is adequate and man's interference is minimal, a natural eastern deciduous forest has evolved. The species growing in abundance alongside the streams, such as black willow, American sycamore, and eastern cottonwood, reflect the alluvial nature of the soils. On the lower slopes of the Cazenovia valley, a yellow birch-American beech-sugar maple association has developed, while the upper slopes support an oak-hickory climax forest, reflecting the dry, excessively drained conditions. Beyond the valley proper, the land is flat and intensely cultivated. A comprehensive listing of vegetation found in Cazenovia basin is given in Table 22.

2.89 Much of the natural vegetation in West Seneca and Buffalo has been sacrificed during residential and commercial development. Floodplain

Table 20

Benthic Invertebrates Inhabiting Cazenovia Creek

Listed in order of decreasing abundance for each reach.

East Branch

Mayfly nymphs
Tendipes (midge) larvae
Caddisfly larvae
Psephenus (waterpenny) larvae
Pentaneura larvae
Elmid beetle larvae
Tubifex worms
Stonefly nymphs
Physa (snail)
Amylus (limpet)
Watermites
Tabanid larvae
Ceratopogonoid (gnat) larvae
Goniobasis (snail)
Gammarus (amphipod)
Leeches

West Branch

Tendipes larvae
Mayfly nymphs
Ceratopogonid larvae
Pentaneura larvae
Simulium (blackfly) larvae
Cranefly larvae
Psephenus larvae
Stonefly larvae
Cyclops

Main Stream

Tendipes larvae
Leeches
Pentaneura larvae
Tubifex worms
Psephenus larvae
Elmid larvae
Physa
Amylus
Simulium larvae

Table 21

Fish Inhabiting the Main Stream of Cazenovia Creek

Generic Name	Common Name
Cyprinidae (minnowlike fish)	
Notropis cornutus	common shiner
Notropis sp.	shiner
Rhinichthys cataractae	longnose dace
Rhinichthys atratulus	blacknose dace
Semotilus atromaculatus	creek chub
Nocomis biguttata	hornyhead chub
Nocomis micropogon	river chub
Campostoma anomalum	stoneroller
Cyprinus carpio	carp
Pimephales notatus	bluntnose minnow
Catostomidae (suckers)	
Hypentelium nigricans	northern hogsucker
Catostomus commersoni	white sucker
Percidae (darters)	
Etheostoma blennioides	greenside darter
Etheostoma caeruleum	rainbow darter
Centrarchidae (bass & sunfish)	
Lepomis gibbosus	pumpkinseed
Amblopites rupestris	rockbass
Micropterus salmoides	largemouth bass
Micropterus dolomieui	smallmouth bass
Ictaluridae (catfish)	
Ictalurus nebulosus	brown bullhead
Noturus flavus	stonecat

Table 22

Cazenovia Creek Basin Vegetation*

Trees

Scientific Name	Common Name
Salix nigra	black willow
Fagus grandiflora	American beech
Acer saccharum	sugar maple
Tusga canadensis	eastern hemlock
Betula lenta	grey birch
Ostrya virginiana	ironwood
Carpinus caroliniana	blue beech
Acer rubrum	red maple
Quercus alba	white oak
Quercus borealis	northern oak
Prunus pennsylvanicus	pin cherry
Populus tremuloides	quaking aspen
Populus grandidentata	bigtooth aspen
Populus deltoides	eastern cottonwood
Rhus typhina	staghorn sumac
Betula alleghaniesis	yellow birch
Ulmus americana	American elm
Ulmus rubra	slippery elm
Ulmus thomasii	rock elm
Pinus strobus	white pine
Juglans cinerea	butternut
Juglans nigra	black walnut
Carya ovata	shagbark hickory
Carya glabra	pigut hickory
Amelanchier laevis	serviceberry
Amelanchier canadensis	shadbush
Fraxinus americana	white ash
Tilia americana	basswood
Platanus occidentalis	sycamore
Liriodendron tulipifera	tulup poplar
Acer negundo	boxelder

Shrubs

Prunus virginiana	choke cherry
Hamamelis virginiana	witch hazel
Taxus canadensis	yew
Vibernum acerifolium	mapleleaf viburnum
Cornus stolonifera	red-osier dogwood
Cornus paniculuta	dogwood sp.

* Various sources used in compilation of this table, but mainly from Zenkert (1934).

Table 22 (Cont'd)

Cazenovia Creek Basin Vegetation*

Shrubs

Scientific Name	Common Name
Sambucus racemosa	elderberry sp.
Rubus allegheniensis	blackberry sp.
Rubus occidentalis	blackberry sp.
Rubus odoratus	blackberry sp.
Salix cordata	willow sp.
Salix longifolia	willow sp.
Cornus rugosa	dogwood sp.
Crataegus punctata	hawthorn sp.
Crataegus roanenses	hawthorn sp.
Crataegus pringlei	hawthorn sp.
Sambucus canadensis	american elderberry
Euonymus obovatus	wahoo
Lonicera canadensis	honeysuckle
Ribes americanum	gooseberry sp.
Ribes cynosbati	gooseberry sp.

Herbaceous Plants

Agropyron repens	quackgrass
Cichorum intypus	chicory
Trifolium repens	white clover
Phleum pratens	timothy
Daucus carota	wild carrot
Melilotus albus	white sweet clover
Melilotus officinalis	yellow sweet clover
Dipsacus sylvestris	teasel
Convolvulus sepium	hedge bindweed
Plantago lanceolata	buckhorn plantain
Solanum dulcamara	bittersweet nightshade
Hypericum perforatum	St. Johnswart
Dactylis glomerata	orchardgrass
Fragaria virginiana	wild strawberry
Sonchus oleraceus	common sowthistle
Ambrosia artemissifolia	ragweed
Taraxacum officinale	dandelion
Rumex crispus	curly dock
Poa sp.	bluegrass
Solilago sp.	goldenrod
Brasica sp.	wild mustard
Arctium minus	burdock
Impatiens pallida	jewelweed
Vitus sp.	wild grape

development has been extensive and along many reaches, streambank vegetation has been entirely removed. Immediately downstream from West Seneca, the creek flows through Cazenovia Park, a 192-acre recreational area where many fine trees of various species are preserved.

2.90 The greatest flood damages in the study area occur in West Seneca in the vicinity of the Union Road bridge. Although much of the area has been developed for commercial and residential uses, many large trees remain. In the reach between Ridge and Leydecker Roads, many magnificent specimens can be found, some exceeding 100 feet in height and 3 feet in diameter. Some trees have been severely damaged by ice floes. The dominant overstory species here are eastern cottonwood and blackwillow, with an understory of boxelder, ironwood, shrub willow, and other woody shrubs. Common groundcover species are chicory, wild carrot, dandelion, burdock, and wild grape. A vegetation and land use map for this area is shown on Plate 16. Plate 17 gives a reference map of the area (see Section 2.132).

2.91 Wildlife

2.92 Some 45 species of mammals occur in the Western New York region according to Hamilton (1943). These are listed in Table 23. It is probable that many of these now occur infrequently or sporadically. Near the major flood damage area in West Seneca, species most likely to be found include various mice, chipmunks, squirrels, and the eastern cottontail rabbit.

2.93 Amphibians and reptiles known to inhabit the Erie-Niagara Region and which might be expected in the Cazenovia basin are listed in Table 24. This information was adapted from "Amphibians and Reptiles of Western New York" by Willard F. Stanley of the State University College at Fredonia, NY.

2.94 Cazenovia basin is an excellent area for birds. Surveys by the Buffalo Ornithological Society (Beardslee and Mitchell, 1965), indicate that some 384 different species occur in the Buffalo area. Of these, some are non-migratory, others are noted only during the summer or winter, and still others are seen only during their migration through the area. A very general classification of the birds occurring in this region is given as follows:

Permanent Residents	24 species
Introduced Permanent Residents	8 species
Summer Residents	118 species
Summer Visitants	3 species
Winter Visitants	38 species
Transient Visitants	114 species
Introduce Rare Transient Visitants	1 species
Rare and Very Rare Visitants	10 species
Casual and Sporadic Visitants	24 species
Accidental Visitants	44 species

Table 23

Mammals Known to Have Occurred in Western New York

Scientific Name	Common Name
Didelphis virginiana	opossum
Parascalops breweri	hairy-taled mole
Condylura cristata	star-nosed mole
Sorex cinereus	common shrew
Sorex fumeus	smoky shrew
Microsorex hoyi	pigmy shrew
Cryptotis parva	short-tailed shrew
Blarina brevicanda	meadow shrew
Myotis lucifugus	little brown bat
Myotis keenii	Say's bat
Myotis sodalis	Indiana bat
Lasionycteris noctivagans	silver-haired bat
Pipistrellus subflavus	pipistrelle
Eptesicus fuscus	big brown bat
Lasiurus borealis	red bat
Lasiurus cinereus	hoary bat
Procyon lotor	raccoon
Mustela cicognanii	small brown weasel
Mustela frenata	eastern long-tailed weasel
Mustela vison	northeastern mink
Lutra candensis	otter
Mephitis mephitis	striped skunk
Vulpes fulva	red fox
Urocyon cinereoargenteus	gray fox
Lynx rufus	bobcat
Marmota monax	woodchuck
Teania striatus	chipmunk
Tamiasciurus hudsonicus	red squirrel
Sciurus carolinensis	grey squirrel
Glauconus volans	flying squirrel
Castor canadensis	beaver
Peromyscus maniculatus	deermouse
Peromyscus leveopus	woodmouse
Synaptomys cooperi	lemming mouse
Clethrionouys gapperi	red-backed mouse
Microtus pennsulvanicus	field mouse
Pitymys pinetorum	pine mouse
Ondatra zibethica	muskrat
Mus musculus	house mouse
Rattus norvegicus	Norway rat
Zapus hudsonius	meadow jumping mouse
Napaeozapus insignis	woodland jumping mouse
Erethizon dorsatum	porcupine
Sylvilagus floridanus	eastern cottontail
Odocoileus virginianus	white-tailed deer

Table 24

Amphibians and Reptiles of Cazenovia Basin

Scientific Name	Common Name
Necturus maculosus	mudpuppy
Ambystoma laterale	blue-spotted salamander
Diemictylus viridesceus	red-spotted salamander
Desmognathus orchrophaeus	Allegheny salamander
Plethodon glutinosus	slimy salamander
Pseudotriton ruber	red salamander
Bufo americanus	common toad
Hyla crucifer	spring peeper
Pseudacris triseriata	western chorus frog
Rana clamitans	green frog
Rana palustris	pickerel frog
Ambystoma jeffersonianum	Jefferson's salamander
Ambystoma maculatum	spotted salamander
Desmognathus fuscus	dusky salamander
Plethodon cinereus	red-backed salamander
Gyrinophilus porphyricticus	spring salamander
Eurycea bislineata	two-lined salamander
Bufo woodhousei	Fowler's toad
Hyla versicolor	common treefrog
Rana catesbiana	bullfrog
Rana pipiens	leopard frog
Rana sylvatica	wood frog

Reptiles

Chelhydra serpentina	snapping turtle
Clemmys guttata	spotted turtle
Clemmys muhlegbergi	bog turtle
Graptemys geographica	map turtle
Emydoidea blandingi	Blanding's turtle
Natrix sipedon	common water snake
Storeria dekayi	DeKay's snake
Thamnophis brachystoma	garter snake
Diadophis punctatus	ringneck snake
Elaphe obsoleta	pilot blacksnake
Stenotherus edoratus	stinkpot
Clemmys insculpta	wood turtle
Terrapene carolina	box turtle
Chrysemys picta	painted turtle
Eumeces authracinus	coal skink
Natrix septemuitlata	queen snake
Storeria occipitomaculata	red-bellied snake
Thamnophis sauritus	ribbon snake
Opheodrys vernalis	green grass snake
Lampropeltis doliata	milksnake

2.95 On a seasonal basis, bird life is essentially static during January and February. A noticeable migration usually begins in March as some of the winter visitants leave for the north; also, during the same month, a noticeable migration occurs from the south involving waterfowl, some birds of prey, and some land birds, in addition to winter visitants leaving the area during April and May. Migration reaches its peak with the spring waterfowl flight, shorebird migration, and the arrival of seedeaters and insectivorous birds. Migratory waterfowl using the flyways in the area include dabbling ducks, diving ducks, Canada geese and swans.

2.96 A complete listing of birds known to occur in the Buffalo area (from Beardslee and Mitchell, 1965) is given in Table 25. Most of these can reasonably be expected to occur in the Cazenovia Creek basin. Of the waterfowl, only dabbling ducks such as the mallard, black duck, gadwall, pintail, green winged teal, blue winged teal, European widgeon, northern shoveller, and wood duck might be expected. The creek is too shallow to support larger waterfowl or diving ducks such as the redhead ring-necked duck, canvasback, greater and lesser scaup, common goldeneye, bufflehead, oldsquaw, harlequin duck, king elder, white winged scoter, black and surf scoters, ruddy duck, and the common, redbreasted, and hooded mergansers.

2.97 Rare or Endangered Species

2.98 Species which are uncommon, rare, or endangered are particularly sensitive to change in the quality of the environment. Included are those species officially listed as rare or endangered in the United States.

2.99 The presence of rare or endangered species within the study area must be ascertained to determine if any improvements which might be recommended would directly (by actually destroying an organism) or indirectly (by habitat destruction or alteration) cause a decline in the rare or endangered populations. The loss of a rare or endangered species, or a decrease in the number of existing individuals with a known population, would constitute a decrease in environmental quality.

2.100 Six threatened wildlife species listed in this statement have ranges which cover the study area, two of which might be expected to be seen in the area. Five of these species are listed in the 1973 edition of "Threatened Wildlife of the United States," and one, the greater sandhill crane (Grus canadensis tabida) is listed in the 1968 edition of "Rare and Endangered Fish and Wildlife of the United States." Both editions are publications of the Department of Interior, Bureau of Sports Fisheries and Wildlife (recently renamed the Fish and Wildlife Service).

2.101 The southern bald eagle, Haliaeetus leucocephalus leucocephalus, (endangered) is known to have been reasonably abundant and to have nested

Table 25

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Permanent Residents	
Accipiter cooperi	Coopers' hawk
Buteo jamaicensis	red-tailed hawk
Falco sparverius	sparrow hawk
Bonasa umbellus	ruffed grouse (3)
Meleagris gallopavo	turkey
Tyto alba	barn owl
Otus asio	screech owl
Bubo virginianus	great horned owl
Strix varia	barred owl
Asio otus	long-eared owl
Dryocopos pileatus	pileate woodpecker
Centrurus carolinus	red-bellied woodpecker
Dendrocopos villosus	hairy woodpecker (2)
Dendrocopos pubsecens	downy woodpecker
Cyanocitta cristata	blue jay
Corvus brachyrhynchos	common crow
Parus atricapillus	black-capped chickadee
Parus bicolor	tuffed titmouse
Sitta carolinensis	white-breasted nuthatch
Thryothorus ludovicianus	Carolina wren
Mimus poyglottos	mockingbird
Richmondena cardinalis	cardinal
Colinus virginianus	bobwhite (2)
Phasianus colchicus	ring-necked pheasant
Alectoris graeca	chukar
Perdix perdix	gray partridge
Columba livia	rock dove
Sturnus vulgaris	starling
Passer domesticus	house sparrow
Summer Residents	
Podilymbus podiceps	pied-billed grebe
Ardea herodias	great blue heron
Butorides virescens	green heron
Nycticorax hoactli	black-crowned night heron
Ixobrychus exilis	least bittern
Botaurus lentiginosus	American bittern
Anas platyrhynchos	mallard
Anas rubripes	black duck
Anas discors	blue-winged teal
Spatula clypeata	shoveler

Table 25 (Cont'd)

Birds Known to Have Been
Sighted in the Buffalo Area

Scientific Name	Common Name
Summer Residents	
Aix sponsa	wood duck
Cathartes aura	turkey vulture
Buteo lineatus	red-shouldered hawk
Buteo platypterus	broad-winged hawk
Circus cyaneus	marsh hawk
Rallus elegans	king rail
Rallus limicola	virginia rail
Porzana carolina	sora
Gallinula chloropus	common gallinule
Fulica americana	American coot
Charadrius vociferus	killdeer
Philohela minor	American woodcock
Capella gallinago	common snipe
Bartramia longicanda	upland plover
Actitis macularia	spotted sandpiper
Larus delawarensis	ring-billed gull
Sterna hirundo	common tern
Chilodonias niger	black tern
Zenaidura macroura	mourning dove
Coccyzus americanus	yellow-billed cuckoo
Caprimulgus vociferus	whippoorwill
Chordeiles minor	common nighthawk
Chaetura pelagica	chimney swift
Archilochus colubris	ruby-throated hummingbird
Megaceryle alcyon	belted kingfisher
Colaptes auratus	yellow-shafted flicker
Melanerpes erythrocephalus	red-headed woodpecker
Sphyrapicus varius	yellow-bellied sapsucker
Tyrannus tyrannus	eastern kingbird
Myiarchus crinitus	great crested flycatcher
Sayornis phoebe	eastern phoebe
Empidonax virescens	Acadian flycatcher
Empidonax traillii	Traill's flycatcher
Emiponax minimus	least flycatcher
Contopus virens	east wood pewee
Eremophila alpestris	horned lark (2)
Iridoprocne bicolor	tree swallow
Riparia riparia	bank swallow
Stelgidopteryx ruficollis	rough-winged swallow
Hirundo rustica	barn swallow
Petrochelidon pyrrhonota	cliff swallow
Progne subis	purple martin
Troglodytes aedon	house wren
Troglodytes troglodytes	winter wren

Table 25 (Cont'd)

Birds Known to Have Been
Sighted in the Buffalo Area

Scientific Name	Common Name
Summer Residents	
Telmatodytes palustris	long-billed marsh wren
Cistothorus platensis	short-billed marsh wren
Dumetella carolinensis	catbird
Toxostoma rufum	brown thrasher
Turdus migratorius	robin (2)
Hylocichla mustelina	wood thrush
Hylocichla guttata	hermit thrush
Hylocichla ustulata	Swainson's thrush (2)
Hylocichla fuscescens	veery
Sialia sialis	eastern bluebird
Polioptila caerulea	blue-gray knatcatcher
Bombycilla cedrorum	cedar waxwing
Lanius ludovicianus	loggerhead shrike
Vireo flavifrons	yellow-throated vireo
Vireo solitarius	solitary vireo
Vireo olivaceus	red-eyed vireo
Vireo gilvus	warbling vireo
Mniotilta varia	black & white warbler
Protonotaria citrea	prothonotary warbler
Vermivora chrysoptera	golden-winged warbler
Vermivora pinus	blue-winged warbler
Vermivora ruficapilla	Nashville warbler
Dendroica petechia	yellow warbler (2)
Dendroica magnolia	magnolia warbler
Dendroica caerulesceus	black-throated blue warbler
Dendroica virens	black-throated green warbler
Debdroica fusca	Blackburnian warbler
Dendroica pensylvanicus	chestnut-sided warbler
Dendroica pinus	pine warbler
Seiurus auroccypillus	ovenbird
Seiurus noveboracensis	northern waterthrush
Seiurus motacilla	Louisiana waterthrush
Oporornis philadelphia	mourning warbler
Geothlypis trichas	yellowthroat
Icteria virens	yellow-breasted chat
Wilsonia citrina	hooded warbler
Wilsonia canadensis	Canada warbler
Setophaga ruticilla	American redstart
Dolichonyx oryzivorus	bobolink
Sturnella magna	eastern meadowlark

Table 25 (Cont'd)

Birds Known to Have Been
Sighted in the Buffalo Area

Scientific Name	Common Name
Summer Residents	
Sturnella neglecta	western meadowlark
Agelaius phoeniceus	red-winged blackbird
Icterus spurius	orchard oriole
Quiscalus quiscula	common grackle
Molothrus ater	brown-headed cowbird
Piranga olivacea	scarlet tanager
Pheucticus ludovicianus	rose-breasted grosbeak
Passerina cyanea	indigo bunting
Carpodacus purpureus	purple finch
Spinus tristis	American goldfish
Pipilo erythrophthalmus	rufous-sided towhee
Passerculus sandwichensis	savannah sparrow
Ammodramus savannarum	grasshopper sparrow
Passerherbulus henslowii	Henslow's sparrow
Pooecetes graminius	vesper sparrow
Junko hyemalis	slate-colored junko (2)
Spizella passerina	chipping sparrow
Spizella pusilla	field sparrow
Melospiza georgiana	swamp sparrow
Melospiza melodia	song sparrow
Summer Visitants	
Florida caerulea	little blue heron
Casmerodius albus	common egret
Nyctanassa violacea	yellow-crowned night heron
Winter Visitants	
Aythya valisneria	canvasback
Aythya marila	greater scaup
Beucephala Clangula	common goldeneye
Bucephala islandica	Barrow's goldeneye
Clangula hyemalis	oldsquaw
Histrionicus histrionicus	harlequin duck
Somateria spectabilis	king eider
Mergus merganser	common merganser
Accipiter geutilis	goshawk
Buteo logapus	rough-legged hawk
Larus hyperboreus	glaucous gull

Table 25 (Cont'd)

Birds Known to Have Been
Sighted in the Buffalo Area

Scientific Name	Common Name
Winter Visitants	
Larus glaucoides	Iceland gull (2)
Larus marinus	great black-backed gull
Larus argentatus	herring gull
Larus ridibundis	black-headed gull
Rissa tridactyla	black-legged kittiwake
Nyctea scandiaca	snowy owl
Asio flammeus	short-eared owl
Picoides arcticus	black-backed three-toed owl
Parus hudsonicus	boreal chickadee
Lanius excubitor	northern shrike
Hesperiphona vespertina	evening grosbeak
Pinicola enucleator	pine grosbeak
Acanthis hornemanni	hoary redpol (2)
Spinus pinus	pine siskin
Loxia curvirostra	red crossbill
Loxia leucoptera	white-winged crossbill
Junco oreganus	Oregon junko
Spizella arbonea	tree sparrow
Calcarius lapponicus	Lapland longspur
Plectrophenax nivalis	snow bunting
Transient Visitants	
Gavia immer	common loon
Gavia stellata	red-throated loon
Podiceps grisegena	red-necked grebe
Podiceps auritus	horned grebe
Podiceps caspicus	eared grebe
Aechmophorus occidentalis	western grebe
Phalacrocorax auritus	double-crested cormorant
Olor columbianus	whistling swan
Branta canadensis	Canada goose (2)
Branta bernicla	brant
Chen hyperborea	snow goose
Chen caerulescens	blue goose
Anas strepera	gadwall
Anas acuta	pintail
Anas carolinensis	green-winged teal
Mareca penelope	European widgeon
Mareca americana	American widgeon
Aythya americana	redhead

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Transient Visitors	
Aythya collaris	ring-necked duck
Aythya affinis	lesser scaup
Bucephala albeola	bufflehead
Melanita deglandi	white-winged scoter
Melanita perspicillata	surf scoter
Oidemia nigra	common scoter
Oxyura jamaicensis	ruddy duck
Lophodytes cucullatus	hooded merganser
Mergus serrator	red-breasted merganser
Accipiter striatus	sharp-shinned hawk
Aquila chrysaetos	golden eagle
Haliaeetus leucocephalus	bald eagle (2)
Pandion halieatus	osprey
Falco peregrinus	peregrine falcon
Falco columbarius	pidgeon hawk
Coturnicops noveboracensis	yellow rail
Charadrius semipalmatus	semipalmated plover
Chardrius melodus	piping plover
Pluvialis dominica	American golden plover
Squatarola squatarola	black-bellied plover
Arenaria interpres	ruddy turnstone
Numenius phaeopus	whimbrel
Tringa solitario	solitary sandpiper
Catoptrophorus semipalmatus	willet
Totanus melanoleucas	greater yellowlegs
Totanus flavipes	lesser yellowlegs
Calidris canutus	knot
Erolia maritima	purple sandpiper
Erolia melanotos	perctoral sandpiper
Erolia fuscicollis	white-rumped sandpiper
Erolia bairdii	Baird's sandpiper
Erolia minutilla	least sandpiper
Erolia alpina	dunlin
Limnodromus griseus	short-billed dowitcher
Limnodromus scolopaceus	long-billed dowitcher
Micropalama himantopus	stilt sandpiper
Ereunetes pusillus	semipalmated sandpiper
Ereunetes mauri	western sandpiper
Tryngites subruficollis	buff-breasted sandpiper

Table 25 (Cont'd)

Birds Known to Have Been
Sighted in the Buffalo Area

Scientific Name	Common Name
Transient Visitors	
Limosa fedoa	marbled godwit
Limosa haemastica	Hudsonian godwit
Crocethia alba	sanderling
Phalaropus fulicarius	red phalarope
Stegnaopus tricolor	Wilson's phalarope
Lobipes lobatus	northern phalarope
Stercorarius pomarinus	pomarine jaeger
Stercorarius parasiticus	parasitic jaeger
Larus atricilla	laughing gull
Larus pipixcan	Franklyn's gull
Larus minutis	little gull
Xema sabina	Sabine's gull
Sterna forsteri	Forster's tern
Hydroprogne caspia	Caspian tern
Aegolius acadicus	saw-whet owl
Tyrannus verticalis	Western kingbird
Empidonax flaviventris	yellow-bellied flycatcher
Nuttallornis borealis	olive-sided flycatcher
Sitla canadensis	red-breasted nuthatch
Certhia familiaris	brown creeper
Hylocichla minima	gray-cheeked thrush(2)
Regulus satrapa	golden crowned kinglet
Regulus calendula	ruby crowned kinglet
Anthus spinoletta	water pipit
Vireo griseus	white-eyed vireo
Vireo philadelphicus	Philadelphia vireo
Vermivora peregrina	Tennessee warbler
Parula americana	parula warbler
Dendroica tigrina	Cape May warbler
Dendroica coronata	Myrtle warbler
Dendroica castanea	bay-breasted warbler
Dendroica striata	blackpoll warbler
Dendroica discolor	prarie warbler
Dendroica palmarum	palm warbler (2)
Oporornis formosus	Kentucky warbler
Oporornis agilis	Connecticut warbler
Wilsonia pusilla	Wilson's warbler
Xanthocephalus xanthocephalus	yellow-throated blackbird

Table 25 (Cont'd)

Birds Known to Have Been Sighted in the Buffalo Area

Scientific Name	Common Name
Transient Visitors	
Euphagus carolinus	rusty blackbird
Ammospiza caudacuta	sharp-tailed sparrow (2)
Chondestes grammacus	lark sparrow
Zonotrichia querula	Harris' sparrow
Zonotrichia leucophrys	white-crowned sparrow
Zonotrichia albicollis	white-throated sparrow
Passerella iliaca	fox sparrow
Melospiza lincolnii	Lincoln's sparrow
Anas crecca	common teal
Spizella pallida	clay-colored sparrow
Cygnus olor	mute swan
Other	
Pelecanus erythrorhyn chus	white pelican
Morus bassanus	gannet
Bubulcus ibis	cattle egret
Pleadis falcinellus	glossy ibis
Pica pica	black-billed magpie
Corvus corax	common raven
Helmintheros vermivorus	worm-eating warbler
	Lawrence's warbler
Dendroica dominica	yellow-throated warbler
Spiza americana	dickcissel
Leucophoyx thula	snowy egret
Hydranassa tricolor	Louisiana heron
Branta leucopsis	barnacle goose
Branta nigricans	black brant
Somateria molissina	common eider (2)
Coragyps atratus	black vulture
Falco rusticolus	gyrfalcon
Laterallus jamaicensis	black rail
Porphyrala martinica	purple gallinule
Philomachus pugnax	ruff
Recurvirostra americana	American avocet
Uria lomvia	thick-billed murre
Surnia ulula	hawk-owl
Strix nebulosa	great grey owl
Aegolius funereus	boreal owl
Picoides tridactylus	northern 3-toed woodpecker
Thryomanes bewickii	Bewick's wren
Bombycilla garrula	Bohemian waxwing
Dendroica nigrescens	black-throated grey warbler

Table 25 (Cont'd)

Birds Known to Have Been
Sighted in the Buffalo Area

Scientific Name	Common Name
Other	
Piranga rubra	summer tanager
Chlorura chlorura	green-tailed towhee
Gavia arctica	Arctic loon
Pterodroma hasitata	black-capped petrel
Pterodroma inexpectata	scaled petrel
Oceanites oceanicus	Wilson's petrel
Phaethon lepturus	white-tailed tropic bird
Pelecanus occidentalis	brown pelican
Plegadis chihi	white-faced ibis
Anser albifrons	white-fronted goose
Mergellus albellus	smew
Elanoides forficatus	swallow-tailed kite
Buteo swainsonii	Swainson's hawk
Grus canadensis	sandhill crane
Haematopus palliatus	American oystercatcher
Numenius americanus	longbilled curlew
Numenius tenuirostris	slender-billed curlew
Heteroscelus incanum	wandering tattler
Catharcta skua	skua
Larus fuscus	lesser black-backed gull
Larus novaeOhollandiae	silver gull
Pagophila eburnea	ivory gull
Sterna paradisaea	arctic tern
Sterna dougallii	roseate tern
Sterna albifrons	least tern
Rynchops nigra	black skimmer
Cepphus grylle	black guillemot
Carduelis carduelis	European goldfinch
Synthliboramphus antiquum	ancient murrelet
Sayornis saya	Say's phoene
Oreoscoptes montanus	sage thrasher
Oenanthe oenanthe	wheatear
Piranga ludoviciana	western tanager
Pheucticus melanocephalus	blackhead grosbeak

successfully along the Niagara River, especially near Goat and Grand Islands before the turn of the century. However, bridges to these islands and residential development along the river displaced these populations. Occasional sightings of this species are reported, but no active nesting sites within Erie County are now known.

2.102 The American peregrine falcon, Falco peregrinus anatum, (endangered) is infrequently seen in the area of the Lake Erie and Lake Ontario shores during their migration through the region. Beardslee and Mitchell (1965) define these periods as March 15 to May 20 and September 6 to October 15, with the greater number being sighted in the fall period. The number of sightings of this falcon in Erie County has been drastically reduced within the last two decades reflecting the serious overall decline in this species.

2.103 The greater sandhill crane, Grus canadensis tabida, is classified as rare. The range for this species is reported to include infrequent breeding in southwestern Ontario. It is known as an accidental visitant to the Niagara Frontier Region. However, in the Niagara Peninsula area of the Province of Ontario a greater sandhill crane was reliably reported in 1969.

2.104 Two mammal species, both endangered, have ranges in this area, though it is highly unlikely that either occurs within Erie County, NY. The Indiana bat, Myotis sodalis, is associated with limestone caves throughout the midwest and eastern United States. Since no limestone caves occur in the project area, this species should not be encountered. The eastern timber wolf, Canis lupus lycaon, did range freely over this region of New York, as it did over most of the eastern United States. However, it is now believed to be nearly, if not totally, extinct within the borders of the original 48 states of the United States except for limited populations in northern Minnesota and Michigan. The last authenticated record of the wolf in New York is 1899, though a sighting is recorded in Fulton County in 1968.

2.105 Another rare species, the bog turtle (Clemmys muhlenbergi) is reported in a broken range from Connecticut to southwestern North Carolina. Conant gives the habitat for this species as swamps, sphagnum bogs, and slow-flowing stream. Such habitats do occur within the Cazenovia Creek Basin, but Conant does not include this area in the range.

2.106 No endemic species have been identified within the project area. The lack of identification of any species does not preclude their existence, though none would be anticipated within this area.

2.107 Aesthetic Qualities

2.108 Cazenovia Creek has considerable scenic values. Upstream from Union Road, the stream rises rapidly, eroding its bed and creating a steep-walled gorge. Vertical outcroppings, initially along the south

bank and varying with the meanders of the creek further upstream, create a rugged and very scenic gorge, particularly in the Elma section. This gorge generally continues upstream along the West Branch to the hamlet of West Falls. Rock is exposed in portions of the stream channel at numerous locations, and the rate of flow is quite rapid. The East Branch, after winding through the Village of East Aurora flows through relatively level terrain and develops extensive meanders with shallow embankments.

2.109 Waste Disposal

2.110 Municipal wastes from South Buffalo and West Seneca are ultimately handled by City of Buffalo treatment facilities. The Town of Aurora's needs are serviced by the Village of East Aurora Sewage Treatment Plant. A small plant is operated in West Falls, while a septic tank effluent interceptor discharges untreated waste into Cazenovia Creek in the hamlet of Holland. Under a State-adopted water resource development plan, these effluents will be pumped to an enlarged East Aurora facility.

2.111 Historical, Archeological, and Paleontological Considerations*

2.112 The early human habitation of the area may be divided into American Indian and Early Settler. The presence of Iroquois Indians and the Buffalo Creek Indian Reservation delayed European settlement until about 1844. Therefore, archeological interest centers on the period of Indian habitation. No sites of unique paleontological interest are known to exist in the area.

2.113 The Indian occupation of the study area prior to the 18th century was by an Iroquois group, the Erie. Their occupation ceased about 1650 A.D. They can be traced back into prehistoric (pre-1575 A.D.) times, where there is a long, probably uninterrupted occupation back to 3000 B.C. at least.

2.114 A number of pre-Reservation archeological sites are reported between Cazenovia Street and Mill Road in West Seneca. Since the Cazenovia Creek Valley has never been systematically surveyed for archaeological sites, it seems likely that those reported are only a fraction of the ones present. Buried occupation sites might be expected in bottomlands like those from Transit Road west.

2.115 The Buffalo Creek Reservation was established in 1797 at the Treaty of Big Tree and included 83,557 acres surrounding the Iroquois settlements on the Buffalo River. During the half century of the Buffalo

*Literature search for archeological survey of the creek and its tributaries was conducted by Professor Marian White, of the Department of Archeology, State University of New York at Buffalo.

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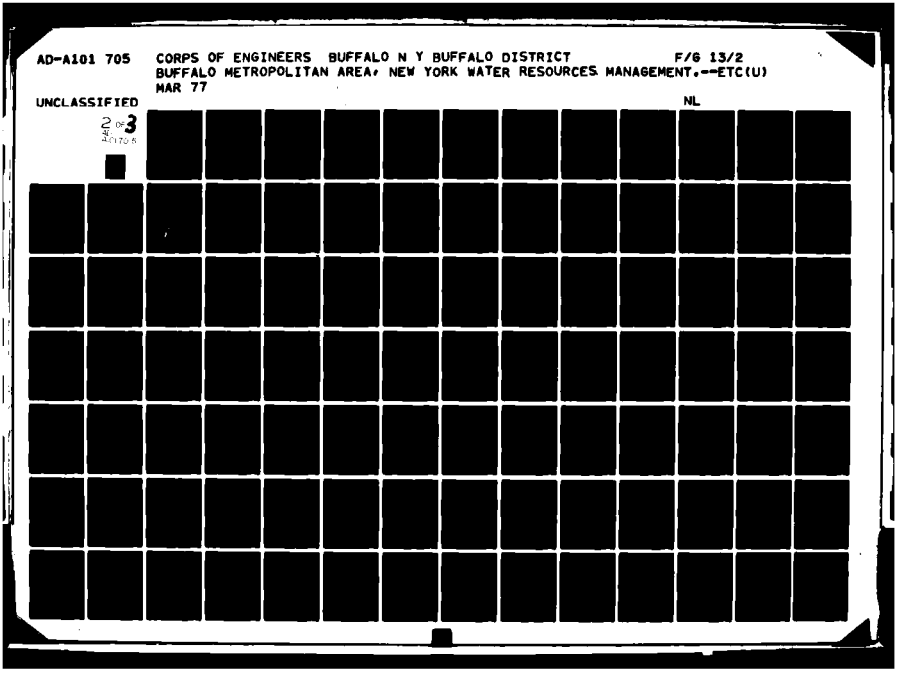


Creek Reservation's existence, it became the center for the remaining Iroquois in New York. While other Reservations were stable or declining, Indians swarmed to Buffalo Creek, which became the political center of Indian-White land deals.

2.116 The population of the Reservation was predominantly Seneca. A number of Cayuga and Onondaga had their own settlements and ceremonial longhouses. There were also Stockbridge from Massachusetts and Delaware from Pennsylvania. These Indians lived in clusters of cabins or in linear arrangements of houses spread out along the trails of which Seneca Street was the main one. This area was one of the centers of activity on the old Buffalo Creek Reservation. The Onondaga village of Big Sky consisting of 28 cabins was scattered along here in 1791. This centered around the old ford, now the bridge on Ridge Road which connects Potters Road to Seneca Street. On the east side of Cazenovia Creek was the Onondaga longhouse which served as council house for the League of the Iroquois and became a focal point of Reservation life. The Reservation population thinned out as one went father from Buffalo, and it is impossible to point to specific settlement locations east of Union Road.

2.117 In 1826, over one-third of the Buffalo Creek Reservation was sold, including the Mile Strip off the southern margin. This sale had little immediate effect upon European settlement, since only two small communities founded by early settlers lay just south of the Reservation. These were Willink (East Aurora) and East Hamburg (Orchard Park), whose communication lines were through the Reservation to Buffalo.

2.118 Between 1844 and 1846, the remainder of the Buffalo Creek Reservation was sold to settlers and most of the Indians moved away, opening the area for quick settlement. A German commercial group known as the Inspirationalists purchased a tract of about 5,000 acres. In 1846, they incorporated the Village of Ebenezer (now Gardenville area). At the same time, other settlers founded the Villages of West Seneca Center, East Seneca, Reserve, Gardenville, and Winchester. Many others, especially Germans, moved into make individual purchases of the fertile land along Buffalo and Cazenovia Creeks.

2.119 The Hart family bought a large parcel of land covering both sides of Cazenovia Creek in what is now South Buffalo. Part of this land is the present-day Cazenovia Park. The Hart holdings were subdivided among members of the family in the late 19th century. This period was also marked by extensive collecting of Indian artifacts by amateur collectors. Those people uncovered the Reservation settlement along Seneca Street and located Indian graves of the Historic Period north of the creek in the area under the present golf course. These may belong to the late 17th century Neutral Iroquois village which was south of the creek in the West Seneca area.

2.120 Extensive surface collections now at the State University of New York at Buffalo show evidence of several Archaic occupations, including Meadow-wood, a Woodland Hunters Home, and a prehistoric Erie Indian village. However, the precise location of any of these occupation areas within the Hart Farm is unknown due to the presence of the park and golf course.

2.121 The birthplace of Millard Fillmore, 13th president of the United States (1850-53), is located in East Aurora. This site has recently been included in the National Register of Historic Places. No other National Register properties or Historic Landmark sites either included or eligible for inclusion in the National Register are known to exist in the Cazenovia basin. To verify this observation, comments have been requested from the New York State Office of Parks and Recreation and the U. S. Department of the Interior. Letters requesting comments from these agencies are included in Appendix B, entitled "Letters of Coordination."

2.122 Socioeconomic Considerations

2.123 Population

2.124 Table 26 presents 1970 U. S. Bureau of Census population data and population projects for 1980 - 2000 for Cazenovia Creek basin communities as developed by the Erie and Niagara Counties Regional Planning Board (ENCRPB). The total basin population in 1970 was 163,847. As projected, this figure will rise to 251,860 by the year 2000. The Towns of Elma, Aurora, Boston, and West Seneca are expected to contribute heavily to this growth.

2.125 Employment, Education, and Income

2.126 For the purposes of this report, Cazenovia Creek is divided into three parts: the upper basin, above the confluence of the East and West Branches; the central basin, including the Towns of Elma and Aurora and the Village of East Aurora; and the lower basin, comprised of West Seneca and South Buffalo. Flood damage is greatest in the lower basin and the community of East Aurora. Proposed remedial efforts would have their greatest socioeconomic impact in the lower and central basins. Socioeconomic data, including data on education and income for the creek basin communities, the county, and the State are given in Table 27. Insofar as the upper basin experiences little serious flood damage and would be little affected by proposed remedial measures downstream, its treatment here will be brief.

2.127 The communities of the upper basin are rural population centers amid extensive agricultural areas and woodlands. On the West Branch, the largest of these are Glenwood and Colden in the Town of Colden. On the East Branch, major communities include West Falls in the Town of Aurora, Holland in the Town of Holland, and South Wales in the Town of Wales.

2.128 The communities of the central basin, including the Villages of East Aurora in the Town of Aurora and Elma in the Town of Elma, are socioeconomically quite similar, as evidenced by the data presented in Table 27. They are suburban towns sharing an attractive wooded locale. The Village of East Aurora, with a populaton (1970 Census) of 7,033, is a small residential community. Population growth, though considerable, is less than in neighboring locales due to limitations on available land. Mean and median income figures (see Table 27) reveal a skewness that indicates high income families. 1970 census data reveal numerous families in the $50,000+ income bracket. Educational attainment is high with over 25 percent of the adult population having completed four or more year of higher education. Census data reveal that many residents of the village hold professional, educational, managerial, and sales positions. Most workers commute by private auto to Buffalo or adjacent towns via Route 400 (Aurora Expressway).

2.129 The Towns of Elma and Aurora are essentially rural communities, but are undergoing rapid suburbanization in their western sectors. They are quite similar in terms of area (35.1 square miles and 36.8 square miles for Elma and Aurora respectively), physical setting, income base, and educational attainment (see Table 27). Historically, farming has played an important role in these communities, but in recent years has declined dramatically due to increasing land values and tax rates. The western sections of Elma and Aurora are the focus of expansion, spurred by the completion of the Aurora Expressway. Land in these areas has been subdivided into attractive homesites which retain the rural style of country living. The eastern sections of these towns have not been developed as extensively, and much of the remaining farmland is situated there. The 1970 populations of Elma and Aurora are respectively 10,011 and 7,400. The populations are heterogeneous--census data indicate that long-established residents are rural/agriculturally oriented and newer residents are suburban/professionally oriented.

2.130 The lower basin includes the major population centers of West Seneca and South Buffalo. West Seneca is one of the fastest growing communities (in terms of population) in Western New York. Once a rustic agricultural community, West Seneca is becoming suburbanized rapidly as need for new housing and skyrocketing land and tax valuations render farming decreasingly profitable. Census figures indicate West Seneca's population was 48,404 in 1970. If growth projections are realized, the town's 21.6 square miles will attain a population of over 80,000 people by the year 2000. From social and economic standpoints, West Seneca is a typical lower middle to middle class suburb, absorbing a large proportion of the outward urban movement. Population mobility is nonetheless considerable, with turnover between 1965 and 1970 ranging as high as 30 percent in individual census tracts (see Table 27). Occupationally, the townspeople are a heterogeneous mix of blue and white collar workers, including many in service-oriented professions.

Table 26

Population in Cazenovia Creek Basin, 1970-2000

AREA	1970		1980		1990		2000	
	Area Population	% of Total Population	Area Population	% of Total Population	Area Population	% of Total Population	Area Population	% of Total Population
South Buffalo[1]	45,015	27.5	40,450	21.0	37,565	16.8	36,515	14.5
West Seneca	48,404	29.5	60,765	31.5	73,725	33.0	82,035	32.6
Elma	10,011	6.1	11,580	6.0	13,155	5.9	14,770	5.9
Aurora	14,426	8.8	16,065	8.3	18,735	8.4	21,335	8.5
Orchard Park	19,978	12.2	33,175	17.2	44,950	20.1	57,265	22.7
Boston	7,158	4.4	8,400	4.4	9,675	4.3	11,135	4.4
Colden	3,020	1.8	3,500	1.8	3,970	1.8	4,510	1.8
Holland	3,140	1.9	3,935	2.0	4,735	2.1	5,535	2.2
Wales	2,617	1.6	3,120	1.6	3,660	1.6	4,220	1.7
Concord	7,573	4.6	9,115	4.7	10,065	4.5	11,315	4.5
Sardinia	2,505	1.5	2,655	1.4	2,870	1.3	3,225	1.3
Total	163,847	99.9[2]	192,760	99.9[2]	223,105	99.8[2]	251,860	100.1[2]

Notes:

(1) South Buffalo defined as Buffalo Projection Boundary Area 2 (Census Tracts 2, 6, 7, 8, 9, 10, 11) by Erie-Niagara Counties Regional Planning Board; all other areas are defined by their respective townships.

(2) Percentages may not add to 100.0% due to rounding.

Sources: N. Y. State Dept. of Commerce, Business Fact Book, Buffalo Area, Part 2, Population and Housing (Albany N. Y. State Dept. of Commerce, 1963), 1940-1960 data, Erie-Niagara Counties Regional Planning Board, Regional Population Projections (Grand Island, NY: Erie-Niagara Counties Regional Planning Board, 1972), 1970-2000 data.

Table 27

General Socioeconomic Data for Cazenovia Creek Basin Communities, 1970

Community	Median School Years Completed	Median Income of Families ($)	Mean Income of Families ($)	% Families Below Poverty Level	% Unemployment	Median Home Value($)	Model Home Value Class ($)	Community Mobility	U. S. Census Tract Number
South Buffalo	11.0-12.1	9,193-10,144	9,926-11,342	1.2-5.9	3.5-4.6	13,100-14,200	10,000-15,000	n.a.	
West Seneca (T)	12.1	11,751	12,274	3.2	1.7-4.5	14,400-22,900	25,000-30,000	11.9	
Elma (T)	12.3	12,404	13,393	4.1	1.8	23,750	25-35,000	8.9	
West Elma (U)	12.1	11,612	11,732	6.2	1.8	21,600	25-35,000	n.a.	141.02
East Elma (U)	12.5	13,231	15,085	2.0	1.9	25,900	25-35,000	n.a.	141.01
Aurora (T)	12.6	12,192	14,346	3.1	1.7	23,800	25-35,000	13.0	
East Aurora (V)	12.6	11,900	14,260	3.0	4.2	20,700	15-20,000	n.a.	139 and 140
Orchard Park (T)	12.4	12,419	15,883	3.3	3.3	23,800	15-20,000	11.6	135
Boston (T)	12.3	11,349	12,002	3.4	3.0	22,200	15-20,000	10.6	152.01
Colden (T)	12.1	9,840	10,778	4.4	5.5	18,700	15-20,000	10.2	151.01
Holland (T)	12.3	9,657	10,115	8.3	5.7	18,500	15-20,000	14.6	150.03
Wales (T)	12.2	10,867	11,341	8.6	2.5	20,500	15-20,000	11.7	150.02

Table 27 (Cont'd)

Community	Median School Years Completed	Median Income of Families ($)	Mean Income of Families ($)	% Families Below Poverty Level	% Unemployment	Median Home Value($)	Model Home Value Class ($)	Community Mobility	U. S. Census Tract Number
Concord (T)	12.1	9,734	10,715	5.7	3.7	15,800	15-20,000	14.8	158
Sardinia (T)	10.4	9,886	10,757	5.1	5.1	15,400	10-15,000	20.0	151.02
Erie County	12.0	10,482	12,205	6.9	4.4	18,500	15-20,000	15.8	
New York State	12.1	10,617	12,498	8.5	3.6	28,200	25-35,000	15.4	

Sources: U. S. Government Printing Office, 1970 Census
New York State Office of Planning Services, 1970 Census Socio-Economic Profile (Albany: New York State Office of Planning Services, 1973)

New York State Office of Planning Services, Selected 1970 Census Statistics for New York State Minor Civil Divisions (Albany: New York State Office of Planning Services, 1973)

Notes: n.a. - not available (V) - village
(T) - town (U) - unincorporated

2.131 For the purposes of this report, South Buffalo is considered to consist of census tracts 2, 6, 7, 8, 9, 10, and 11, lying along the southeast perimeter of the city. This is primarily a residential area, reporting a 1970 population of 45,015. Census figures indicate that blue-collar workers are heavily represented in the area's labor force. Many residents are employed by nearby industries, such as the Republic and Bethlehem steel plants. Housing density is high due to the small size of individual plots. Except for Cazenovia Park, open land is virtually nonexistent and flood plain development is extensive. Population growth is expected to be slow.

2.132 Existing Development and Land Use

2.133 Residential, Commercial, and Industrial Development

2.134 Existing land uses in Cazenovia Creek basin follow a typical pattern: agricultural uses are supplanted by residential, commercial, and eventually industrial development radiating outward from a central hub of activity, in this case, Buffalo. While upper basin communities are still agriculturally oriented, central and lower basin communities are now undergoing the process of urbanization, as farmlands are sub-divided for residential use. Table 28, derived from the 1964 Census of Agriculture, Erie County, prepared by the Department of Agricultural Economics, Cornell University in 1967, gives agricultural data for communities of the Cazenovia Creek basin. While the data was not extrapolated beyond 1964, the decline of farming in the area, especially in the lower and central basins, is evident.

2.135 At present, the most concentrated residential, commercial, and industrial developments are in the lower basin. With the exception of small industrial parks in Elma, Orchard Park, and West Seneca, basin industry is confined within the Buffalo City Limits. Heavy industry is actually located downstream of the Buffalo River-Cazenovia Creek confluence, and hence out of the study area proper. However, strong economic interaction is to be expected between these heavy industries (such as Republic Steel) and the lower basin communities. The lower basin itself is the site of many warehouses and some light industrial development.

2.136 Commercial development is quite extensive in the lower basin and is concentrated along major thoroughfares such as Seneca Street and Union Road. For example, Southgate Plaza is located at the junction of these roads in West Seneca. This shopping complex includes 43 stores and 500,000 square feet of floor space. About 30 other businesses are in the near vicinity of Southgate Plaza. Approximately three miles west of Southgate Plaza is Seneca Mall, a larger shopping complex. Plates 16 and 17 are land use and reference maps for the West Seneca area of the lower basin.

2.137 Recreation

2.138 There are a variety of recreational facilities in the study area, including town and County parks. Cazenovia Park in South Buffalo includes several baseball diamonds and a golf course and provides opportunities for

picnicking in summer and sledding in winter. Mill Road Park in West Seneca provides limited facilities in a scenic woodland setting. Facilities for skiing and tobagganing are available in the upper portions of the basin where, in addition, Emery Park in South Wales and Sprague Brook Park in Concord provide camping, hiking, and picnicking opportunities. Table 29 lists the facilities available at these parks. Table 30 gives visitation figures for these parks for the years 1969-1973 as compiled by the County Division of Parks. West Seneca is also the site of several bowling alleys and a proposed indoor ice rink complex.

Table 28

Cazenovia Creek Basin Agricultural Data

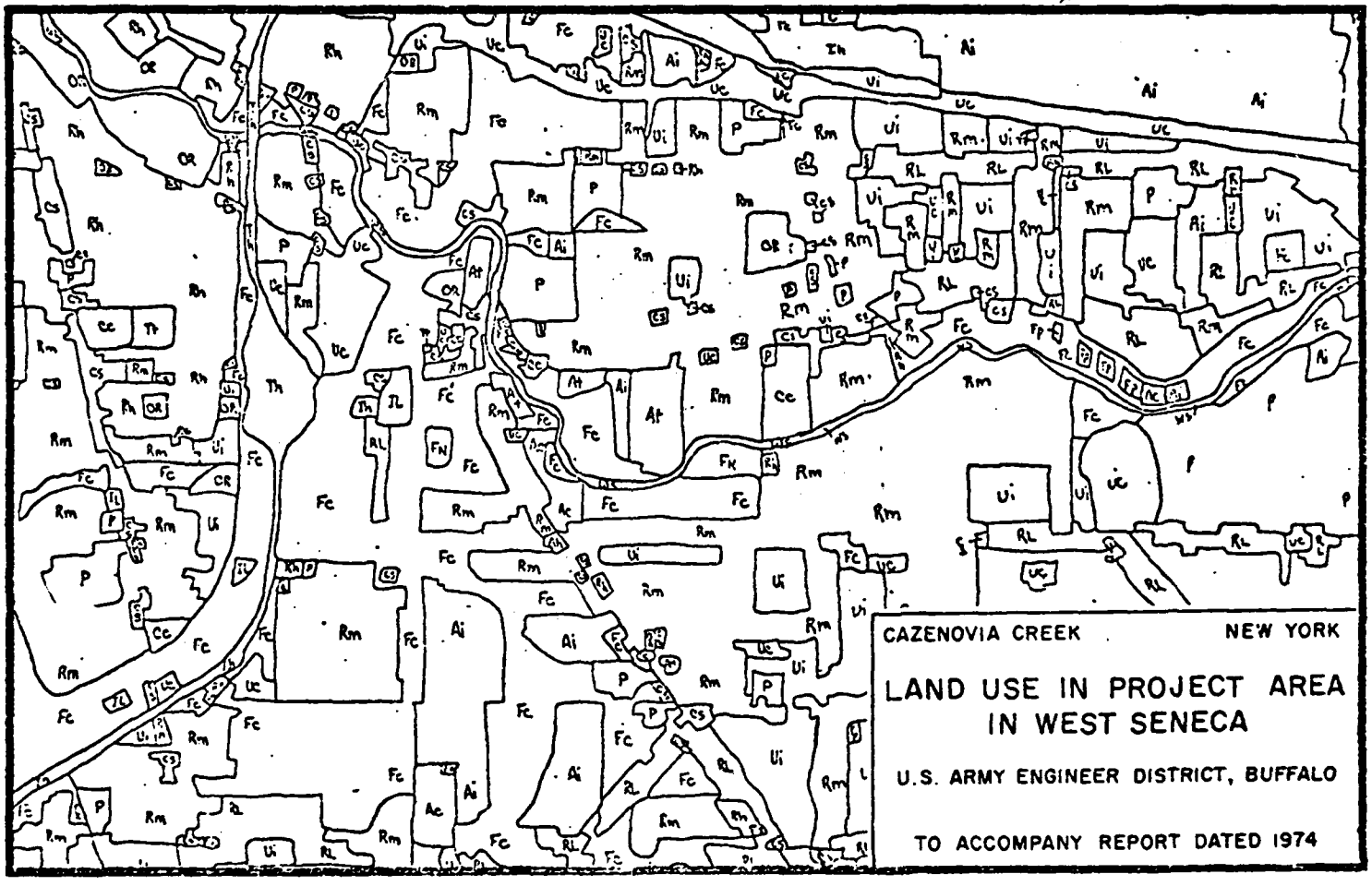
Location	1954		1959		1964	
	Farm Acreage	Number of Farms	Farm Acreage	Number of Farms	Farm Acreage	Number of Farms
Lower Basin	NA	NA	NA	NA	3,108	98[1]
Central Basin						
Elma	12,870	214	10,441	117	9,509	101
Aurora	11,307	132	7,248	76	6,208	56
Orchard Park [2]	12,003	207	8,213	121	5,793	83
Wales [2]	16,217	125	14,376	94	11,934	76
Upper Basin						
Boston	14,461	158	10,252	91	9,970	79
Colden	12,814	113	7,992	63	8,557	66
Concord	33,476	272	29,233	218	27,558	169
Holland and Sardinia	41,254	306	27,597	169	24,211	141

[1]Census included all of Buffalo, Grand Island, Lackawanna, Cheektowaga, and Tonawanda in this figure.

[2]Only small portions of these towns are actually in Cazenovia Creek Basin.

NA - not available.

Source: 1964 Census of Agriculture, Erie County, Cornell University, 1967.



NOTE: SEE NEXT PAGE FOR LAND USE AREA CODES

PLATE 16

LAND USE AREA CODES

Active Agriculture

Ao Orchard
Av Vineyard
Ah Horticulture
At High intensity
Ac Cropland/Cropland pasture
Ap Permanent pasture

Inactive

Ai Ag. Extensive
Ui Urban Intensive
Uc Ui Under construction

Specialty Farms

Ay Mink, Game, Aquatic Ag., Horse farms

Forestland

Fc Brush cover up to fully stocked poles less than 30' (may be Fb, early map)
Fn Forests over 30'
Fp Plantations - any size

Water

Wn Natural - any size
Wc Artificial 1 acre
Ws Streams, rivers 100'

Wetlands

Wb Bogs, shrub wetlands
Ww Wooded wetlands
Wm Marine waters-navigable (St. Lawrence & Great Lakes)
Wh Hudson River

Non-productive

Ns sands
Nr exposed rocks

Public

P All categories

Residential

Rh High density-50' frontage
Rm Medium density-50-100' frontage
Rl Low density-over 100' frontage
Rs Strip with Max. of 1/3 intermixture of Cs Commercial
Rr Rural hamlet
Re Estates 5 acres
Rc Farm labor camp

Shoreline

Rk Shoreline developed

Commercial

Cu Urban (downtown)
Cc Shopping center
Cs Commercial strip with max. of 1/3 intermixture of Rs or Density Housing
Cr Resorts

Industrial

Il Light manufacturing
Ih Heavy manufacturing

Outdoor Recreation

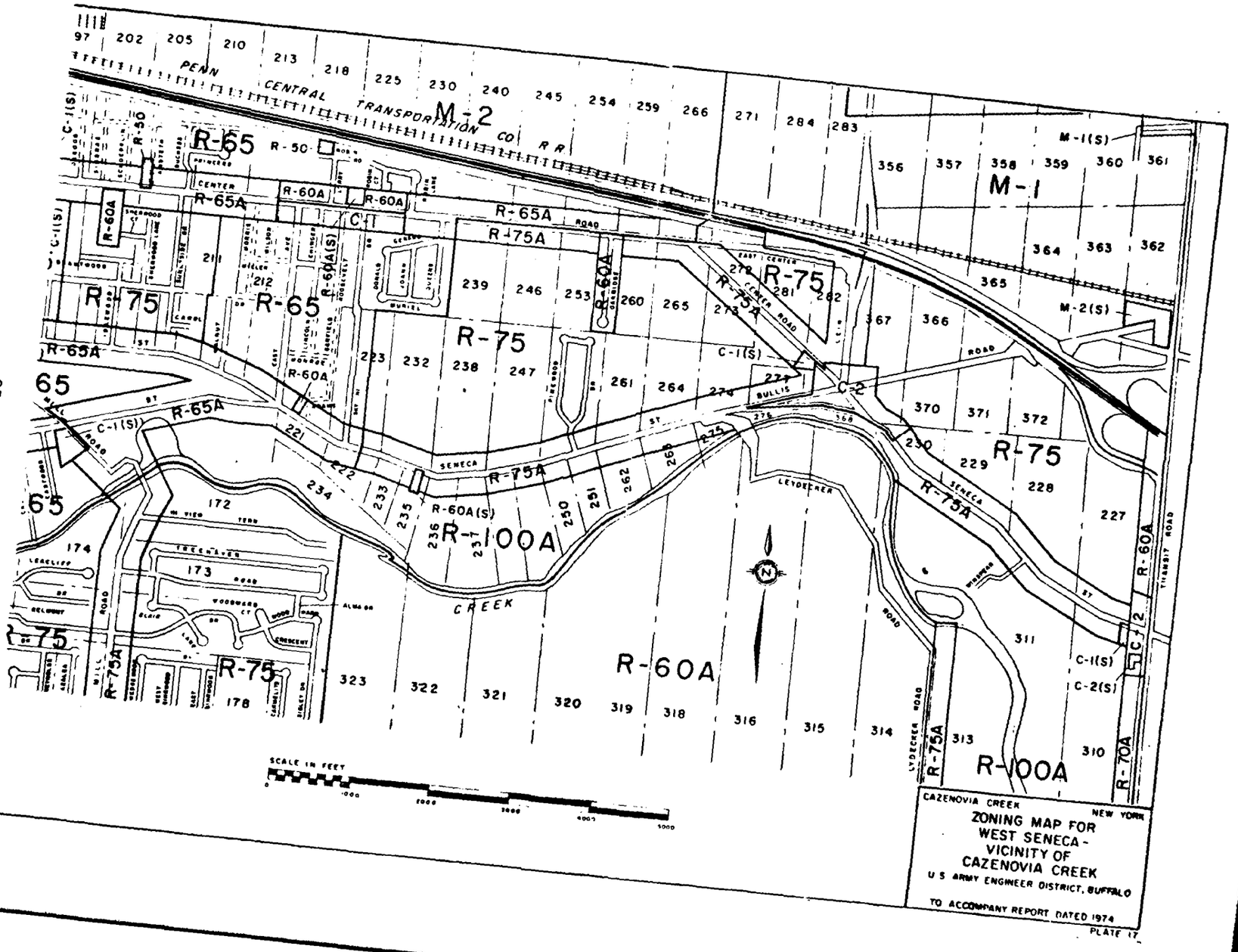
OR All categories

Extractive

Eg gravel, sand
Es stone quarries
Em minerals, cement, clay
Eu oil, gas, salt

Transportation

Th highway (limited access)
Tb barge canal (channel, lock)
Tp port or dock
Td ducks or dams
Ts shipyards
Ta airport-any type
Tr railroad


PENN CENTRAL TRANSPORTATION CO R R
M-2
M-1
M-1(S)
M-2(S)
R-65
R-50
R-65A
R-60A
R-60A(S)
R-75
R-75A
R-100A
R-70A
C-1
C-1(S)
C-2
C-2(S)
CENTER ROAD
EAST CENTER
SENECA ROAD
BULLIS ROAD
SENECA CREEK
LEYDECKER ROAD
TIMBERIDGE ROAD
SCALE IN FEET
0 1000 2000 3000 4000 5000
CAZENOVIA CREEK NEW YORK
ZONING MAP FOR
WEST SENECA -
VICINITY OF
CAZENOVIA CREEK
U S ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1974
PLATE 17

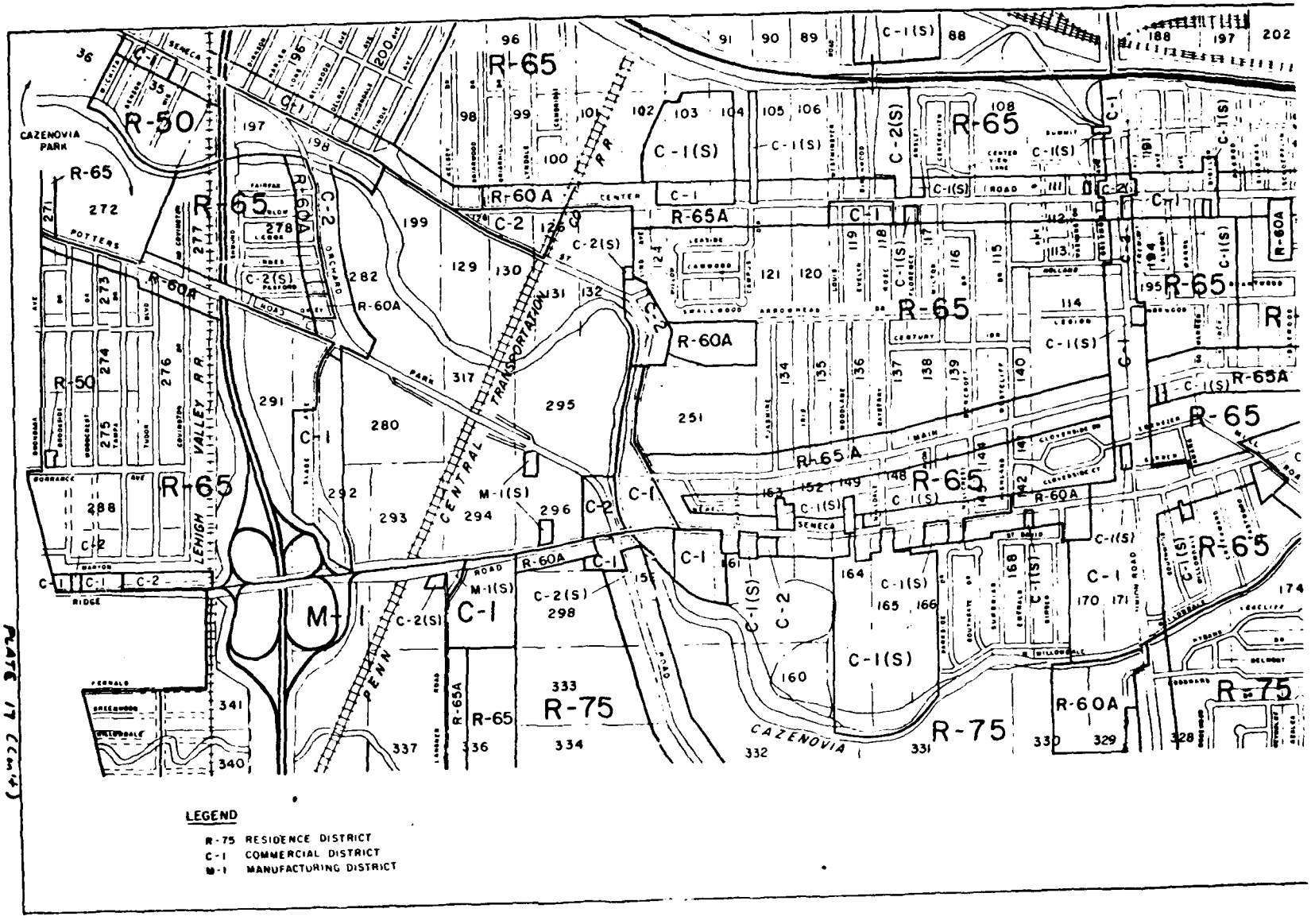

CAZENOVIA PARK
R-50
R-65
R-60A
R-65A
C-1
C-2
C-1(S)
C-2(S)
M-1
M-1(S)
R-75
LEGEND
R-75 RESIDENCE DISTRICT
C-1 COMMERCIAL DISTRICT
M-1 MANUFACTURING DISTRICT

Table 29

Facilities Inventory for Public Parks in Cazenovia Creek Basin

	Cazenovia Park	Emery Park	Sprague Brook Park	Mill Road Park
Picnic Tables	x	x	x	x
Baseball	x	x	x	
Golf Course	x	x	x	
Skiing		x	x	
Hiking Trails		x	x	
Fishing			x	
Bike Paths	x	x	x	

Table 30

Visitation Data for Public Parks in Cazenovia Creek Basin

	Emery Park	Sprague Brook
1973	639,551	164,875
1972	381,839	95,279
1971	271,603	102,617
1970	305,471	68,036
1969	424,402	-

* no data available for Mill Road Park or Cazenovia Park

Information in these tables derived from Erie County Division of Parks records.

2.140 Future Development and Land Uses

2.141 Urbanization and changing land use from agriculture to other uses is expected to continue in this basin. According to the Erie and Niagara Counties Regional Planning Board (ENCRPB), all of the lower and central basin will become urbanized by 1990. Small industrial parks in West Seneca, Elma, and Orchard Park may reasonably be expected to expand. As shown in Plate 17, a zoning map, the open land in West Seneca bordering Cazenovia Creek is zoned for residential or commercial development, including proposed development of an apartment complex and an ice skating facility.

2.142 Future Recreational development might be in accordance with the Parks, Recreation and Open Space Study Plan, completed in 1969 by the Erie and Niagara Counties Regional Planning Board, which noted that the shortage of open space in Erie and Niagara Counties could, without remedial action, become more significant in the future. The report noted that open space in outlying areas would have to be acquired to supplement the parkland needs of more intensely developed areas. The study recommended public acquisition and control of open space land along streams such as Cazenovia Creek and in forest areas for use as linear environmental corridors.

2.143 Cazenovia Creek can be regarded as a corridor penetrating an urbanized area. Acquisition of open space which is in the midst of developed land and is easily accessible by the surrounding population would help to more fully utilize the recreational potential of Cazenovia Creek while at the same time discouraging undesirable developments in floodprone areas of the valley.

2.144 The ENCRPB formulated a land use development plan which included provision for the preservation of environmentally or aesthetically prominent natural features. In addition, such features would be made accessible to the public by the creation of an environmental corridor consisting of a series of small parks and bicycle and pedestrian paths linking Cazenovia Park in South Buffalo to Emery Park in South Wales. Plate 18 illustrates the ENCRPB recommended land use plan.

2.145 The Regional Recreation Implementation Study and Plan prepared by the ENCRPB in September 1971 proposed the following parklands:

a. Cazenovia Park Extensions - Vacant areas on either side of the creek west of the New York State Thruway would form extensions to the existing Cazenovia Park. The flood plain area on the north bank may be preserved through flood plain zoning. Three small areas totaling 12 acres are provided.

b. Town Park - West Seneca - The ENCRPB proposed a 37-acre strip park east of Orchard Park Road with access to the opposite side of the creek provided by a pedestrian bridge. Based on discussions with nearby residents, artifacts such as arrowheads can occasionally be found here as the site was once an Indian burial ground and has significant historical value.

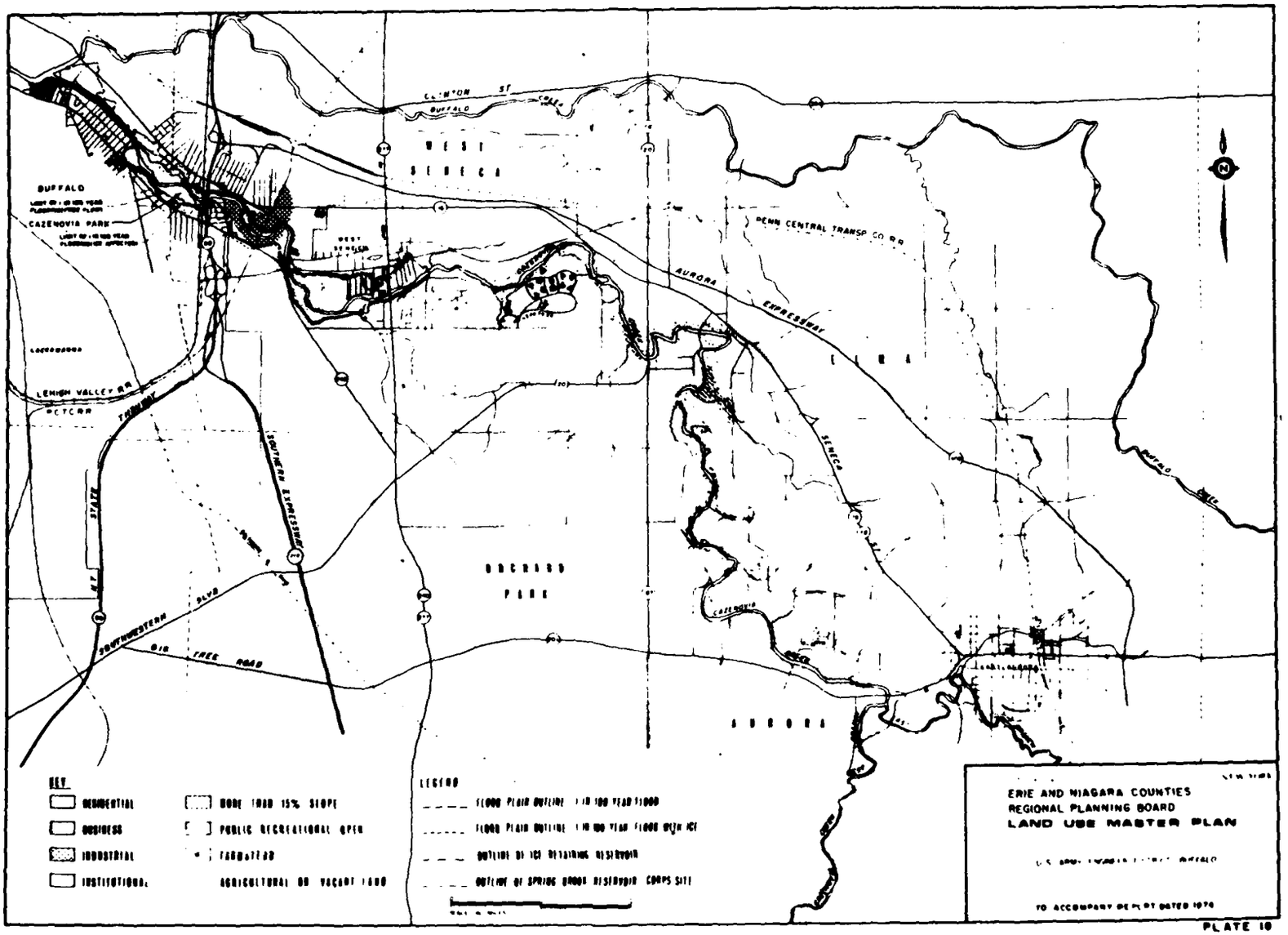

BUFFALO
CAZENOVIA PARK
WEST SENECA
ORCHARD PARK
AURORA
PENN CENTRAL TRANSP CO RR
AURORA EXPRESSWAY
LEHIGH VALLEY RR
SOUTHERN EXPRESSWAY
SOUTHWESTERN BLVD
BIG TREE ROAD
KEY
RESIDENTIAL
BUSINESS
INDUSTRIAL
INSTITUTIONAL
PUBLIC RECREATIONAL OPEN
AGRICULTURAL OR VACANT LAND
LEGEND
ERIE AND NIAGARA COUNTIES
REGIONAL PLANNING BOARD
LAND USE MASTER PLAN

PLATE 18

c. Town Park - West Seneca - Upstream from Ridge Road there is a rather extensive flood plain area which is vacant and partially wooded. This area is presently zoned for residential and commercial uses. However, the ENCRPB Plan proposed a park at this location utilizing the flood plain on both sides of the stream, with access points from Seneca Street, Orchard Park Road, and East-West Road. Since portions of this flood plain have already been encroached upon, this area should receive high priority. The park would provide 200 acres of recreational area.

d. State Park - East of Northrup Road from Leydecker Road to the Town of Aurora is the most scenic and accessible reach of the Cazenovia Creek, consisting of a rugged gorge and heavily wooded areas. The ENCRPB Plan recognizes this recreation potential and proposes preserving open space throughout this section of Cazenovia Creek. The ENCRPB has suggested that this area receive major attention by the Niagara Frontier State Parks Commission. A State Park including a forest preserve should be developed in the form of a linear open space corridor extending from Leydecker Road to Willardshire Road near the Elma-Aurora Township boundary. A forest preserve is suggested between Leydecker and Northrup roads including an intensely developed park section along the creek. The plan proposes a continuation of the forest preserve upstream to the Aurora town line. Lands required for the forest preserves and intervening park section total almost 800 acres.

e. Town Park - East Aurora - A town park covering approximately 43 acres of land is proposed at the confluence of the East and West branches of Cazenovia Creek west of the Village of East Aurora.

f. Village Park - East Aurora - Within the Village of East Aurora immediately east of Mill Road the East Branch of Cazenovia Creek abruptly turns southward. The ENCRPB has proposed that the village purchase the 25 acre area within this meander and develop it as a village park.

g. Emery Park Extension - Emery Park is one of the most intensely used County parks at the present time and, with accessibility facilitated by means of the Aurora Expressway, usage will probably increase. To provide additional parklands with access to the creek, the ENCRPB has proposed that the 22 acres of land along the east bank of the stream extending south to Emery Road be purchased.

h. State Parks - Spring Brook Reservoir - Should a reservoir be constructed in the Spring Brook area, a State park bordering the reservoir has been suggested. The total area considered for parklands in this alternative amounts to 1,310 acres. With this plan, the parks discussed previously in (c), (e), and (f) above would be eliminated from the ENCRPB-proposed development.

2.146 Transportation

2.147 Improved Federal, State, County and town highways provide access to and within the Cazenovia Creek watershed. The Interstate Thruway, Aurora Expressway, Route 16, and Route 219 are the main arterials connecting the City of Buffalo to the outlying portions of the watershed. Union and Transit Roads are also important north-south thoroughfares. A line of the Baltimore and Ohio Railroad follows the upper valley of the West Branch in a north-south direction, a line of the LeHigh Valley Railroad crosses the basin in West Seneca, and lines of the Penn-Central Transportation Company Railroad cross the valley in north-south and east-west directions. Several commercial airlines serve the area from facilities at the Greater Buffalo International Airport in Cheektowaga, which is accessible from anywhere in the study area.

2.148 Environment in Vicinity of Proposed Ice Retention Structure

2.149 The ice retention structure would span Cazenovia Creek approximately 1,000 feet east of the Seneca Street-Main Street intersection in West Seneca. The immediate vicinity may be considered as the area between the West Seneca State School and Seneca Street, extending from the site of the ice retention structure east to the Leydecker Road bridge (see Plate 3). This area encompasses approximately 100 acres of lowlying floodplain, including 60-70 acres of completely undeveloped woody scrubland.

2.150 The open areas support many species of trees and woody shrubs. Dominant overstory tree species are black willow and eastern cottonwood, often associated with an understory of ironwood and boxelder. Common shrubs and herbaceous plants include wild grape, shrub willow, staghorn sumac, wild carrot, burdock, chicory, and mulberry. These scrublands provide habitats suitable for many of the smaller wildlife species found in the basin, including many small amphibians and reptiles, various songbirds, pheasant, cottontail rabbit, skunk, raccoon, opossum, and numerous small rodents.

2.151 Cazenovia Creek is wide and shallow in this area, with an average width of 150 feet and summertime depth certainly less than one foot. The bottom here is a pavement of friable dark grey shale interbedded with thin layers of limestone. The stream in this reach supports a variety of small minnows, frogs, and insect larvae.

2.152 Development in the vicinity of the proposed works is primarily residential, centered along Seneca and Leydecker Roads. Approximately 35 private residences are located here, with current market values ranging from $30-40,000. Two small farmsteads and approximately 20 acres of agricultural land are also located in the area. No industries or commercial enterprises are located here. An abandoned warehouse is situated alongside the creek near the Seneca Street-Leydecker Road intersection. Mill Road Park, the only park in West Seneca, is located about 1/2 mile west of the project site.

2.153 Data for 1970 Census Tracts which overlay the area reveal that residents are a mix of blue and white collar workers, including teachers and professionals. Levels of educational attainment and income are typical of the entire Town of West Seneca (see Table 27). No schools are located in the immediate area although East Senior High School, with a 1973 enrollment of 1916 students is situated approximately 1/4 mile north of Seneca Street.

2.154 Flooding Problem

2.155 This section presents a detailed history of flooding along Cazenovia Creek. Much of the data given here is the results of reconnaissance undertaken during or shortly after high water periods, and on a survey conducted in 1972 by the Corps of Engineers to determine damages within much of the study area. During the survey, residents were interviewed and information gathered pertaining to water elevations for varous floods, past damages, and projected future damages for floods of equal or greater magnitude. A search was made of newspaper files, historical documents, gage records, and other sources. Note, however, that no flood of 100-year or standard project magnitude has ever been recorded.

2.156 Existing Regulations

2.157 Implementation of flood plain management measures is the responsibility of local communities. New York State enabling statutes, which permit City zoning, specify (Chapt. 21, Art. 2-A, Sec. 24) that "such regulations shall be designed to secure safety from fire, floods, and other dangers, and to promote health and welfare." New York State Village Law (Chapt. 64, Art. 6-A, Sec. 177) provides for similar powers to villages, and Town Law (Chapt. 62, Art. 16, Sec. 263) states that "such regulations shall be made in accordance with a comprehensive plan and designed to lessen conjestion in the streets, to secure safety from fire, floods, panic, and other dangers, to promote health and general welfare." In addition, Sec. 277 concerning planning boards and official maps states that "land shown on such plots shall be of such character that it can be used safely for building purposes without danger to health or peril from fire, flood, or other menace."

2.158 Flood Insurance

2.159 Flood insurance, if established on a sound and equitable basis, could relieve the local financial burden of flood damages and provide another supplement to programs for reducing flood damage. However, insurance rates should realistically reflect the flood risk to discourage improper development of flood plains. A recently enacted amendment to the National Flood Insurance Bill, called the Flood Disaster Protection Act of 1973 (Public

Law 93-234), establishes a program of Federal assistance for flood insurance to be related to a unified national program for flood plain management. The program:

a. Substantially increases the limits of coverage authorized under the National Flood Insurance program.

b. Provides for the expeditious identification of, and the dissemination of information concerning floodprone areas.

c. Requires States or local communities, as a condition of future Federal financial assistance, to participate in the flood insurance program and to adopt adequate flood plain ordinances with effective enforcement provisions consistent with Federal standards to reduce or avoid future flood losses.

d. Requires the purchase of flood insurance by property owners who would be assisted by Federal programs or by Federally supervised, regulated, or insured agencies or institutions in the acquisition or improvement of land or facilities located or to be located in identifed areas having special flood hazards.

e. Areas identified to be floodprone areas must participate by 1 July 1975 in the flood insurance program or lose eligibility in Federally-funded projects that would be located in such areas.

2.160 Status of Flood Insurance Programs

2.161 Areas along Cazenovia Creek which have qualified at present for emergency flood insurance are:

a. Town of West Seneca

b. Town of Elma

c. Village of East Aurora

d. City of Buffalo

2.162 The most probable future role for flood insurance is in providing a useful means of accomplishing other programs which will reduce the risk to a point where insurance is economically feasible. Flood insurance is not a complete solution to flood problems, but a possible means of providing the difference between partial flood protection and complete coverage against loss of structures already within the flood plain.

2.163 Flood Warning and Forecast Services

2.164 No flood warning or forecast services are presently available to residents of Cazenovia Basin despite its floodprone history. In a 1973 study of flood and erosion damage downstream of Cazenovia Park commissioned by the City of Buffalo, DeLeuw-Cather and Company recommended that such services be implemented with all speed. They present an empirically derived statistical method which would predict damaging flood stages on the basis of readily available meteorological and hydrological data.

2.165 Status of Existing Plans and Improvements

2.166 Various improvements to Cazenovia Creek and Tannery Brook have been made both by Federal and local authorities with a view to providing flood protection at different locations. Reference to Plates 1 and 2 will aid the reader during the discussion of these improvements.

2.167 The City of Buffalo is involved in a program of removing willow trees from the banks of the creek downstream of Cazenovia Street bridge and lining the banks with concrete slope walls. This program was initiated in 1960 and is planned to be continued in the future. The intent of the program is to reduce the friction along the creek banks to improve the hydraulic efficiency of the channel and to allow the ice to flow freely through this reach.

2.168 In the vicinity of Cazenovia Street bridge, vertical retaining walls have been constructed on both banks over a distance of 1,300 feet. A three foot high concrete dam originally constructed to maintain a recreational pool in Cazenovia Park was removed by the City of Buffalo in the winter of 1964-1965.

2.169 In 1960, the City constructed a levee along the left bank from Cazenovia Street to Green Road to prevent overbank flows in this reach. However, because the levee reduced valley storage and interferred with ice flow movement, the City removed the levee in 1965 and constructed a new levee set back from the bank. A levee along Beyer Street on the right bank was constructed in 1964.

2.170 Since 1963, the City of Buffalo has maintained an ice patrol on Cazenovia Creek. The main objective of this patrol is to report on ice breakup conditions in the creek and help prevent ice jams within the City limits. Amphibious vehicles break up the ice cover in the lower reaches of the creek to help the ice enter the Buffalo River and flow into Lake Erie.

2.171 In 1947, the Corps of Engineers conducted a clearing and snagging project between Ridge Road and Mill Road at a cost of $24,900.

2.172 In 1971, the Corps of Engineers completed a snagging and clearing project in West Seneca upstream of Cazenovia Park at a cost of $44,000. This program included the removal of sand bars in the reach between the New York State Thruway and a point about 1,500 feet above Mill Road.

2.173 Above Ridge Road the creek is contained on the left bank by a 30-foot high bluff. The right banks from Union Road bridge to a point 900 feet downstream was raised and protected by concrete bag riprap in 1960. A partial levee was constructed by a developer in 1963 extending for 600 feet from Sunbriar Drive towards Parkside Drive. Natural weathering and flooding have destroyed this levee. Riprap has been placed along the foot of the bank in various locations from Ridge Road to a point upstream of Mill Road by the Soil Conservation Service. In addition, some channel improvement was carried out by the Corps of Engineers in the middle of this reach in 1970.

2.174 Upstream of Mill Road, improvements have been confined to measures taken by local agencies to conteract specific problems within their areas of jurisdiction. From Mill Road to the confluence of the East and West Branches of Cazenovia Creek near East Aurora, the creek is contained in a gorge and flood protection is not necessary. The Towns of Aurora and Colden have on various occasions carried out channel improvements along stretches of the creek. These improvements have included the removal of gravel bars restricting flow through various sections and causing bank overtopping.

2.175 SCS was authorized, under the Flood Control Act of 1944, to assist local sponsors in applying flood control and land treatment measures in the Buffalo Creek Watershed (includes Cazenovia Creek). The sponsoring local group, the Joint Board of Directors of the Erie and Wyoming County Soil and Water Conservation Districts, are carrying out the operation and maintenance responsibilities for the completed project. These districts are also carrying out programs of Land Treatment in the entire portion of the watershed for their respective counties, SCS provides technical assistance, as needed, to these districts in carrying out these responsibilities.

2.176 In the West Branch, there have been no significant flood control improvements along the creek.

2.177 Flood control measures along Tannery Brook have included clearing and snagging in 1959 and replacement of two East Aurora bridges (Maple Road and Pine Street) in 1963. During recent winters, the Village of East Aurora has discharged backwash water into the brook from Water Treatment Plant softeners to prevent formation of ice. The village has also used an ice-breaking technique similar to that used by the City of Buffalo in order to keep the channel clear. These measures have proved reasonably effective.

2.178 Flood Stages and Discharges

2.179 According to records, flooding took place in February and March 1904, January 1929, March 1942, March 1955, March 1956, January 1959, January 1962, March 1964, February 1965, December 1969, January 1970 and March 1972.

The maximum discharge on record is 13,500 cfs occurring during the flood of March 1955. Because of ice jams, flood stages along Cazenovia Creek are often produced by discharges which would be non-damaging under free-flow conditions. This is best exhibited by the flooding which occurred during January 1962, when a maximum discharge of 5,400 cfs was recorded, although the maximum stage on the Ebenezer gage was listed as 11.33 feet. Table 31 shows data for annual maximum instantaneous discharges and stages of the creek at the Ebenezer gage from 1941 to 1972. All elevations in this report are based on the United States Coast and Geodetic Survey (U.S.C. & G.S.) datum.

Table 31

Annual Maximum Instantaneous Discharges and Stages of Cazenovia Creek
(U.S.G.S. Gage at Ebenezer)

ANNUAL MAXIMUM INSTANTANEOUS DISCHARGE			ANNUAL MAXIMUM INSTANTANEOUS STAGE		
WATER YEAR	DATE	DISCHARGE c.f.s.	GAGE HEIGHT ft. (1)	DATE	ADJUSTED DISCHARGE c.f.s.(2)	GAGE HEIGHT ft. (1)
1941	Apr 5	6,820	11.95	Apr 5	6,820	11.95
1942	Mar 17	11,200	15.11	Mar 17	11,200	15.11
1943	Apr 28	6,600	11.85	Apr 28	6,600	11.85
1944	Jun 24	8,490	13.28	Jun 24	8,490	13.28
1945	Mar 3	5,070	9.61	Feb 22	2,100	12.20 (5)
1946	Oct 2	9,530	14.05	Jan 5	4,000	14.41 (5)
1947	Apr 5	9,210	13.02	Apr 5	9,210	13.02
1948	Feb 19	5,220	9.75	Feb 19	5,220	10.20 (5)
1949	Jan 5	4,770	9.36	Jan 5	4,770	9.87 (5)
1950	Mar 27	6,480	10.85	Mar 27	6,480	10.85
1951	Jan 4	7,330	11.56	Jan 4	7,330	11.56
1952	Mar 11	6,510	10.64	Mar 11	6,510	10.64
1953	May 26	7,110	11.14	May 26	7,110	11.14
1954	Mar 25	5,570	10.02	Mar 25	5,570	10.02
1955	Mar 1	13,500	15.82	Mar 1	13,500	15.82
1956	Mar 7	13,000	14.65	Mar 7	13,000	14.65
1957	Jan 22	12,100	14.09	Jan 22	12,100	14.09
1958	Jun 13	4,610	8.72	Jun 13	4,610	8.72
1959	Jan 22	12,600	14.40	Jan 22	12,600	14.46 (5)
1960	Mar 30	7,160	10.82	Mar 30	7,160	10.82

Table 31 (Cont'd)

ANNUAL MAXIMUM INSTANTANEOUS DISCHARGE				ANNUAL MAXIMUM INSTANTANEOUS STAGE			
WATER YEAR	DATE	DISCHARGE c.f.s.	GAGE HEIGHT ft. (1)	DATE	ADJUSTED DISCHARGE c.f.s.(2)	GAGE HEIGHT ft. (1)	
1961	Apr 25	7,910	11.37	Apr 25	7,910	11.37	
1962	Jan 27	5,400	10.39	Mar 12	5,000(3)	11.33	(5)
1963	Mar 17	5,980	9.91	Mar 17	5,980	9.91	
1964	Mar 5	6,940	10.65	Mar 5	6,940(4)	10.65	(5)
1965	Feb 8	4,070	8.20	Feb 8	4,070	11.28	(5)
1966	Feb 11	4,160	8.29	Feb 11	4,160	9.34	(5)
1967	Sep 29	8,020	11.45	Sep 29	8,020	11.45	
1968	Jan 30	4,770	8.86	Jan 30	4,770	8.86	
1969	Dec 28	6,910	10.63	Dec 28	6,910	10.63	
1970	Apr 2	6,050	9.97	Apr 2	6,050(4)	9.97	
1971	Nov 28	5,110	9.17	Feb 27	4,200	9.34	(5)
1972	Jun 23	12,300	13.53	Jun 23	12,300(4)	13.53	

(1) Elevation of gage zero: 604.86

(2) Values used in developing stage-discharge and stage-frequency relationships for ice-affected flow at each index point.

(3) From U.S.G.S. Water Supply Paper 1677

(4) Instead of this value, the following value of ice-affected discharge having occurred the same year was used in developing stage-discharge and stage-frequency relationships for ice-affected flows at the specified index point(s).

DATE	ADJUSTED DISCHARGE	INDEX POINT
25 January 1964	3800	3B
29 January 1970	3090	3B and 3C
2 March 1972	9800	3B

2.180 Notatable Storms

2.181 General climatological information for Cazenovia Creek basin is discussed in Section 2 of this report. Specific meteorological events which resulted in flooding conditions in the basin are discussed in this section.

2.182 Storms which resulted in major floods along the creek occurred in June 1937, March 1942, March 1955, March 1956, January 1959, January 1970, and March 1972. Some of these are discussed below.

2.183 On 1 March 1955, a thunderstorm caused heavy rains to fall on frozen ground for a period of six hours. Only a trace of snow was reported on the ground on the days preceding this storm. The storm caused the maximum recorded discharge on Cazenovia Creek, 13,500 cubic feet per second (cps).

2.184 On 20 January 1959, a major storm system developed over the central and south central states and moved northeastward bringing heavy rainfall over Western New York on 21 January. Due to a heavy snow cover (9 inches) runoff was again augmented by snowmelt and frozen ground conditions. On 21 and 22 January the snow melted rapidly due to heavy rainfall and temperatures in the 50's. Flood conditions were further aggravated when high flows broke up the thick ice cover on the stream. Numerous ice jams occurred along the creek, especially near Cazenovia Street bridge, Buffalo and West Willowdale Drive and Parkside Drive, West Seneca.

2.185 On Wednesday morning, 1 March 1972, a low pressure system moved into the western Great Lakes region. A warm front extended eastward from the low center through Western New York near the Pennsylvania border. With temperatures in the 50's and moderate rainfall, high runoff occurred. The resulting high flows caused the ice cover on the creek to break up. An ice jam occurred just upstream of the Ridge Road Bridge extending approximately to the Union Road bridge, causing widespread flooding in West Seneca.

2.186 The magnitude of flooding affected by ice jamming on 22 January 1959 warranted a detailed field survey to obtain high-water-mark data and determine the extent of flooding. An analysis of these data and data gathered during other floods indicated that the stages of the 1959 flood were the maximum of record throughout most of the study area. Sufficient high-water-mark data from the 1959 flood were available to adequately reconstruct the flood surface profile. This profile was used as a pattern to develop the 100-year profile used in the analysis and sizing considered local protection measures. High-water-mark data for known ice affected flows were used in developing stage-discharge and stage-frequency relationships discussed below.

2.187 Discharge-Frequency Relationships

2.188 The discharge-frequency analysis for the creek at the Ebenezer gage was based on annual maximum instantaneous discharge data shown in Table 31. These data, published by the U.S.G.S., were gathered at the Ebenezer gage over a period of 32 years. The discharge values presented were obtained through use of a continually updated rating curve. Stages are recorded continuously and the resulting continuous hydrograph is used with the rating curve to determine average daily, annual maximum, and annual minimum instantaneous discharges. Values obtained by use of this method are accurate in summer, but less accurate during winter and spring due to backwater effects of floating ice and ice jams. The U.S.G.S. data have been adjusted to reflect the effects of ice on measured stages and, consequently, published flows. The stage values of the continuous stage-hydrograph for a known ice affected flow are adjusted to reflect stages the same flow probably would have caused if it had not been affected by ice. Several factors were considered in adjusting the recorded values, including base flow, air temperature, precipitation, snow cover, flow at other nearby gaging stations, and, sometimes, discharge measurements made during an event.

2.189 The discharge-frequency relationship for the creek at the Ebenezer gage was established through a log-Pearson, Type III, distribution analysis in which the annual maximum instantaneous discharges for the period of record were used. The relationship, shown by the curve on Plate 19, indicates that there is a one percent chance that a discharge of 16,800 cubic feet per second will be exceeded in any one year. Over a long period, a flow of 16,800 cubic feet per second will occur on the average of once every 100 years at the Ebenezer Gage. For comparison, the discharge values used in the distribution analysis were plotted on Plate 19 using Beard's plotting position method.

2.190 Stage-Discharge Relationships

2.191 To facilitate the flood damage analysis and evaluation of alternative flood management measures, the primary flood damage area, located in the lower part of the basin, was divided into three reaches based on differences and similarities in hydraulic characteristics, land uses, flood mode, etc. Each of these reaches was subdivided further, and each subreach represented during hydraulic analyses by an individual index point. Table 32 and Plate 2 locate each subreach and index point. Stage-discharge relationships for free flow, shown on Plate 20 were developed for each index point from water surface profile computations using computer program 22-52-L232, Water Surface Profiles, developed by the Engineering Center at Davis, CA. The computational procedure is similar to Method I presented in Appendix III of EM 1110-2-1409 entitled Backwater Curves in River Channels, dated December 1959. Known discharges from the Ebenezer

gate were backwatered upstream and resultant stages were correlated with known high-water-mark data and the gage rating curve to model the flow regime of the creek.

2.192 Assumed stage-discharge relationships for ice affected flow, shown on Plate 20, were developed in the following manner. For each index point the elevation of the surface of each ice affected flow (the elevation of the U.S.G.S. Ebenezer gage zero plus the stage at that point) was plotted as a function of the adjusted discharge value for that flow. Smooth curves were then fitted through the so-plotted points for each index point. Reach 1A is unaffected by ice jams primarily because the City of Buffalo, by use of amphibious vehicles, continually breaks ice cover on the Buffalo River and Cazenovia Creek. Therefore, a curve to show the ice affected stage-discharge relationship for the creek at index point 1A was not developed.

2.193 Stage-Frequency Relationships

2.194 Stage-frequency relationships for free flow were developed by use of discharge-frequency and stage-discharge relationships, while these for ice-affected flows were developed in the following manner. The adjusted values of those discharges which caused the annual maximum instantaneous stages shown in Table 31 were used with the stage-discharge curves for each index point to obtain the surface elevation of each flood of record at each index point. The surface elevations of floods affected by ice were obtained from the estimated ice rating curve. The surface elevations of floods not affected by ice were obtained from the free flow rating curve. For each index point, the so-obtained values of flood elevations for the period of record were ranked in descending order and plotted using Beard's plotting position method. Curves were then fitted through these plotted points. These curves are shown on Plate 21 for both ice affected and free flow conditions.

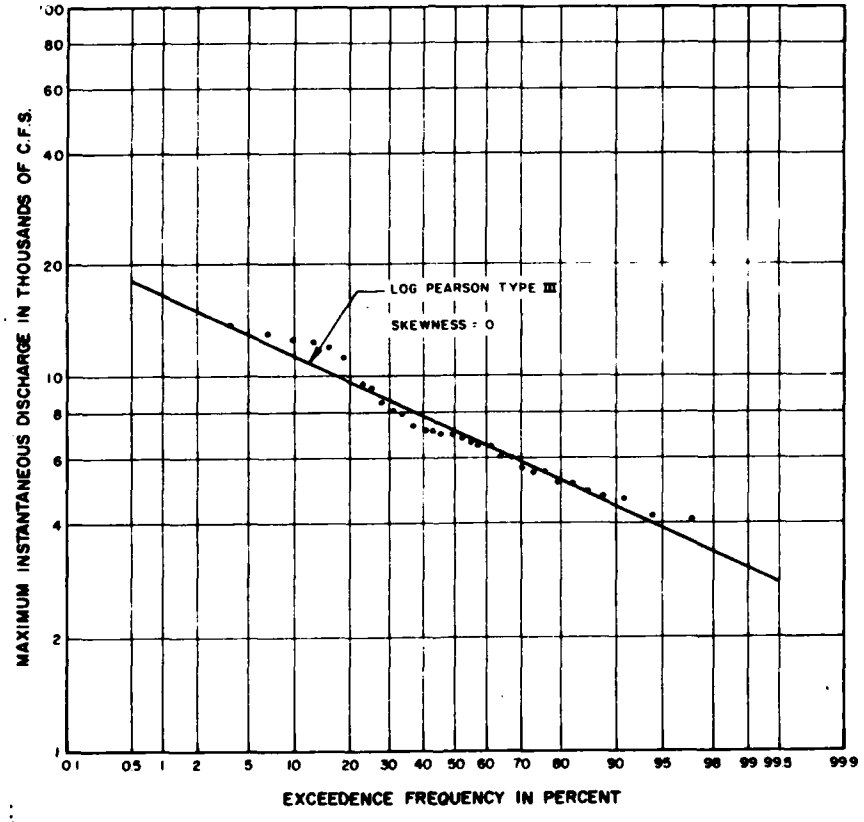
2.195 Stream Velocities

2.196 The relatively low flows occurring in Cazenovia Creek during the winter months permit an ice cover to form over large stretches of the creek. The water then continues to flow under the ice and, provided the flow remains reasonably constant, no change in the ice cover takes place. However, a sudden increase in flow caused by runoff from snowmelt or precipitation disturbs this stable condition. Ice starts to break up and travel downstream. The free ice is unable to pass under the stable cover in downstream reaches where the velocity is lower, causing ice jams. The temporary damming effect might increase stages to the extent where overtopping of the banks and local flooding can occur.

Table 32

Subreaches and Index Points
For Lower Basin

Subreach	Downstream and Upstream Limits	Index Point Location
	Confluence with Buffalo River	
1A		Sta. 0+00, confluence with Buffalo River
	Cazenovia Street Bridge	
1B		Sta. 82+00, downstream of Green Road Bridge
	New York State Thruway Bridge	
2A		Sta. 130+00, upstream of NY State Thruway Bridge
	Orchard Park Road Bridge	
2B		Sta. 211+50, downstream of Ridge Road Bridge
	Ridge Road Bridge	
3A		Sta. 214+00, upstream of Ridge Road Bridge at Ebenezer Gage.
	Downstream of Parkside Drive (West Seneca)	
3B		Sta. 273+50, downstream of Southgate Plaza
	Downstream edge of Southgate Plaza	
3C		Sta. 308+00, downstream of Mill Road Bridge
	Upstream of Mill Road Bridge	



LEGEND

• : HISTORICAL EVENTS
USGS RECORDS

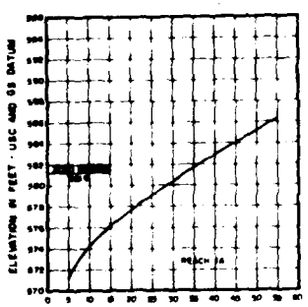
CAZENOVIA CREEK NEW YORK

DISCHARGE - FREQUENCY CURVE FOR CAZENOVIA CREEK AT EBENEZER GAGE

U.S. ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1976

PLATE 19



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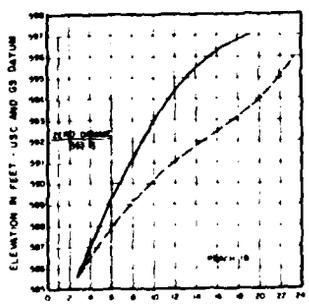
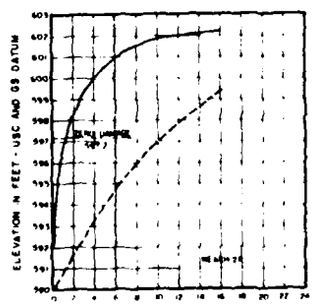
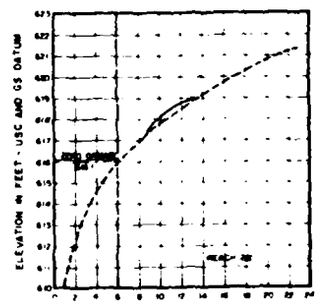
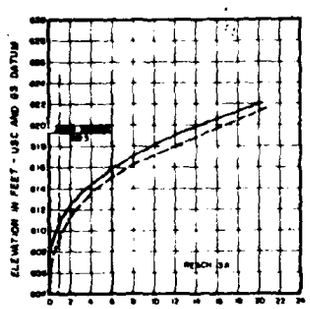
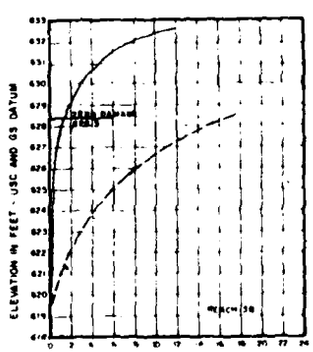
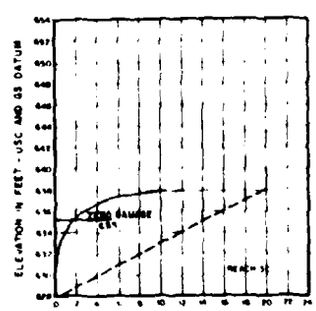












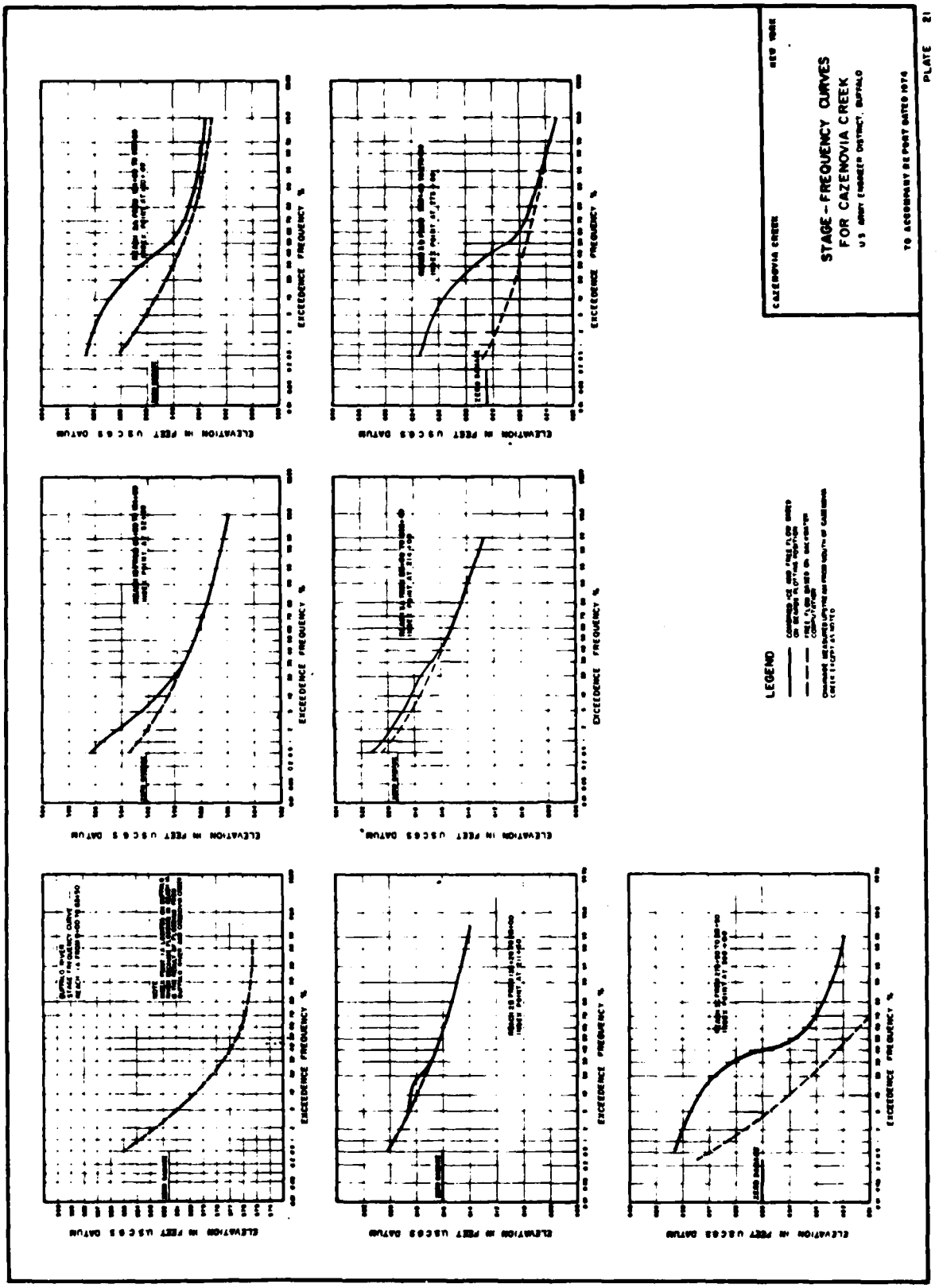
LEGEND

CAZENOVIA CREEK

STAGE–DISCHARGE CURVES
FOR CAZENOVIA CREEK

U S ARMY ENGINEER DISTRICT, BUFFALO

PLATE 20


STAGE-FREQUENCY CURVES
FOR CAZENOVIA CREEK
PLATE 21
LEGEND
EXCEEDENCE FREQUENCY %
ELEVATION IN FEET USC&GS DATUM

2.197 Past experience has indicated that a stable ice cover can form and be maintained on a stream of this type when velocities do not exceed 2.25 feet per second (fps). Velocity profiles for various discharges along the lower portion of Cazenovia Creek were determined by using the Corps of Engineers HEC-2 Backwater Program. The velocity profiles for flows of 500 cfs, 1,000 cfs, and 2,000 cfs are indicated on Plate 22. These profiles indicate that in several reaches of Cazenovia Creek the velocity can be maintained below 2.25 fps for discharges in the range of 500 to 1,000 cfs. Considerations of this type are critical in the design of reservoirs to control flow during the critical winter months, encouraging the formation of a stable ice cover.

2.198 Unit Hydrograph

2.199 Unit hydrographs were developed from data obtained at the Ebenezer gage using actual streamflow and climatological data. Storms used in the study were selected on the basis of the following criteria:

a. known uniform rainfall and distribution;

b. unfrozen ground preceding the rainfall; and

c. a bank-full peak stage.

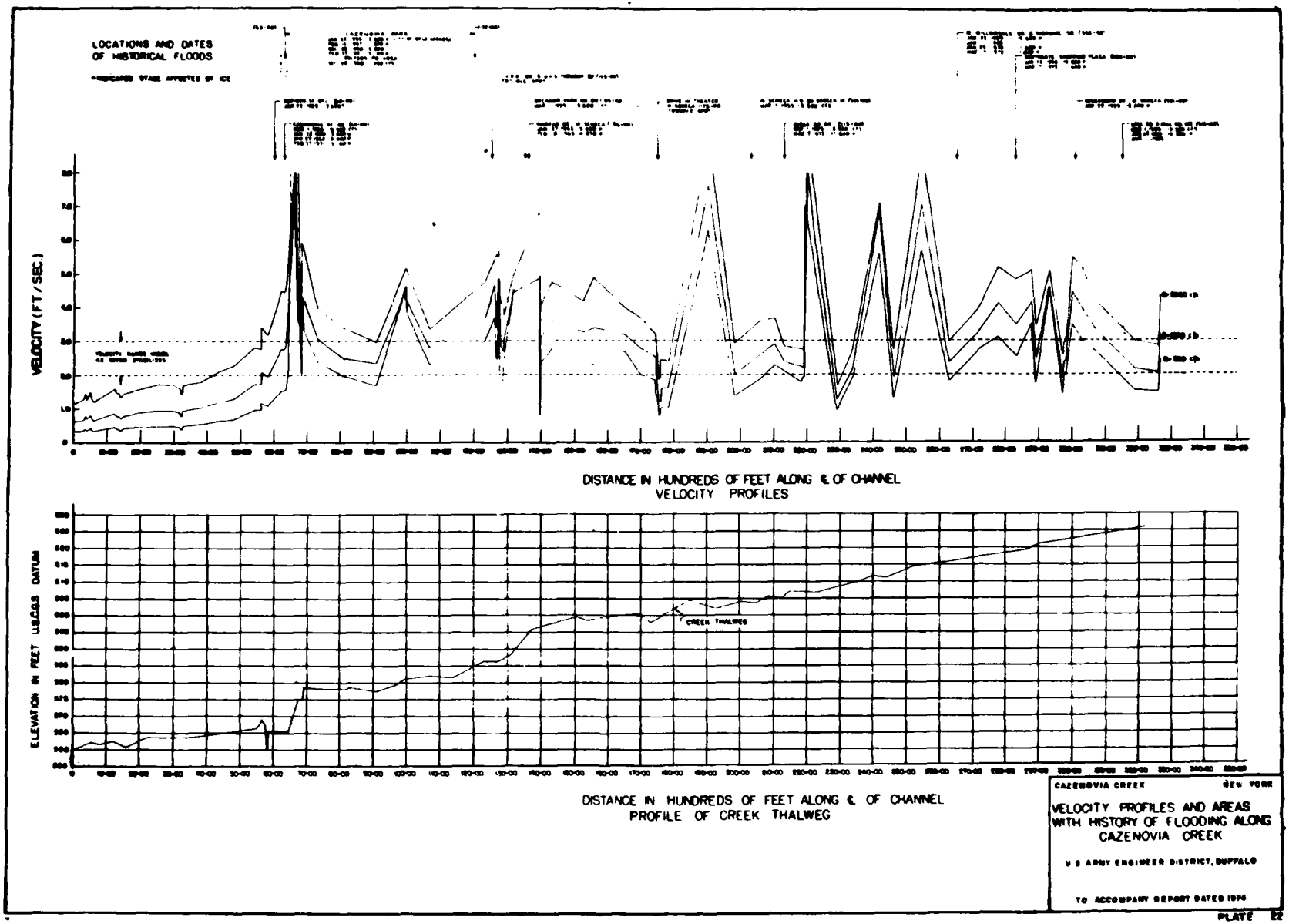
Two storms, one in June 1944 and the other in October 1945, met the criteria and were used. A unit hydrograph was derived from each storm, then checked by reproducing the actual hydrograph from the other storm. From these two unit hydrographs, an average unit hydrograph was developed and is shown with Snyder's coefficients on Plate 23.

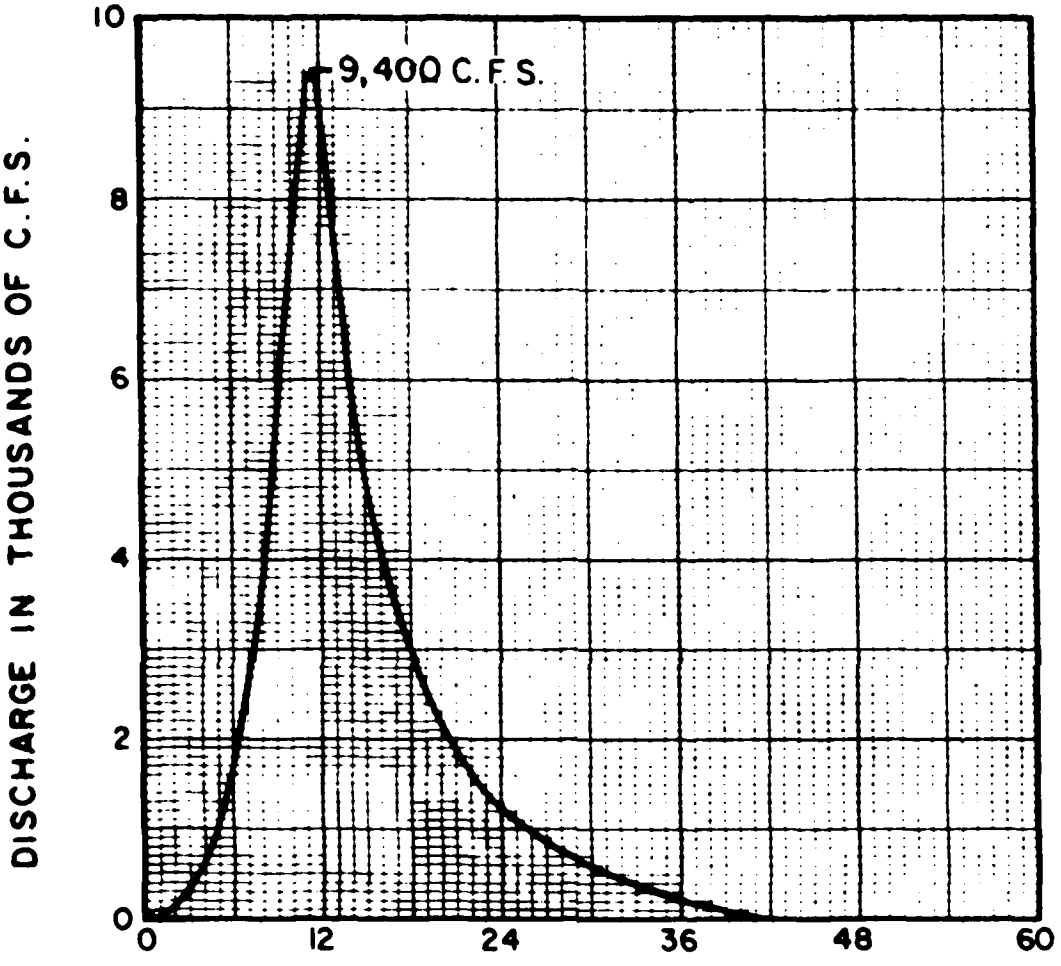
2.200 Standard Project Flood

2.201 The standard project flood hydrograph was derived using USCE Engineering Manual No. 1110-2-1411 "Standard Project Flood Determinations," and Hydrometeorological Report No. 33. The standard project flood of 77,000 cfs, approved by OCE 1 May 1973, was used for design purposes in this study.

2.202 Hydrology for Tannery Brook Basin

2.203 Although flooding occurs almost annually along Tannery Brook, there has never been a gaging station on this tributary of Cazenovia Creek, nor are there any stream discharge records or stage measurements. This may be due in part to the small (2.8 square miles) drainage area of the brook. Flooding on Tannery Brook has been analyzed by using high-water-marks established by field surveys. These surveys indicate that the March 1955 flood was the highest in recent years, although a flood in the 1930's was


LOCATIONS AND DATES
OF HISTORICAL FLOODS
VELOCITY (FT/SEC.)
DISTANCE IN HUNDREDS OF FEET ALONG ℄ OF CHANNEL
VELOCITY PROFILES
ELEVATION IN FEET U.S.C.&G.S. DATUM
CREEK THALWEG
DISTANCE IN HUNDREDS OF FEET ALONG ℄ OF CHANNEL
PROFILE OF CREEK THALWEG
CAZENOVIA CREEK
NEW YORK
VELOCITY PROFILES AND AREAS
WITH HISTORY OF FLOODING ALONG
CAZENOVIA CREEK
U S ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1974
PLATE 22



NOTES

D A = 136 SQ MI
C_t = 1.43
640Cp = 693

CAZENOVIA CREEK NEW YORK

3-HOUR UNIT HYDROGRAPH FOR CAZENOVIA CREEK AT EBENEZER

U.S.ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1974

PLATE 23

probably higher. There were indications that ice jams raised the stages of the January 1959 and February 1961 floods to the water surface profile of the 1955 flood in some reaches.

2.204 The large population turnover in the flooded area, the effects of ice jams, and the relatively small range of elevations complicated the problem of establishing high-water-marks. Slope-area determinations utilizing these high-water-marks were made in an attempt to estimate the discharge of the March 1955 flood. Due to some vague high-water-marks and the fact that water overflows into an adjacent watershed, the results of these determinations were inconclusive.

2.205 Due to variable effects of ice jams and generally vague data on flood profiles, it was not possible to develop reliable stage-discharge relationships. In the absence of reliable stage-discharge data, there was no need to determine the discharge-frequency relationship in the damage area. Stage-damage and stage-frequency relations would be developed without reference to discharge. Therefore, stage-discharge curves for existing conditions in the damage area were not used in the economic analysis.

2.206 As was done for the lower portion of Cazenovia Creek, Tannery Brook was divided into three damage reaches, each represented by an index point (see Plate 24). Stage-frequency curves were determined for each index point by arraying the stages of known floods in descending order and assigning each an estimated return interval based on the known number of years the flood had not been exceeded. The plotting position was then calculated by the Weibull equation, $P = m/(n + 1)$, since it is more conservative than Beard's plotting point method. These stage-frequency curves are shown on Plate 25.

2.207 Since no stream flow data were available, development of a unit hydrograph was accomplished by synthetic means. Necessary parameters, such as Snyder's coefficients, were available from previous studies made on Cayuga, Buffalo and Cazenovia Creeks. After calculating the maximum ordinate and time of runoff by three different methods, it appeared the best results were obtained when using Snyder's method (see Plate 26.)

2.208 For the standard project flood, rainfall excesses as indicated by the Engineering Manual No. 1110-2-1411, Standard Project Flood Determinations (formerly C.W.I. 52-8) were applied to the synthetic unit hydrograph. The result was a hydrograph with a peak flow of 4,900 cfs.

2.209 Present Flood Damages

2.210 Both tangible and intangible damages and losses are experienced during flooding along Cazenovia Creek. Tangible damages and/or losses include: physical damage to flooded structures, utilities, and transportation

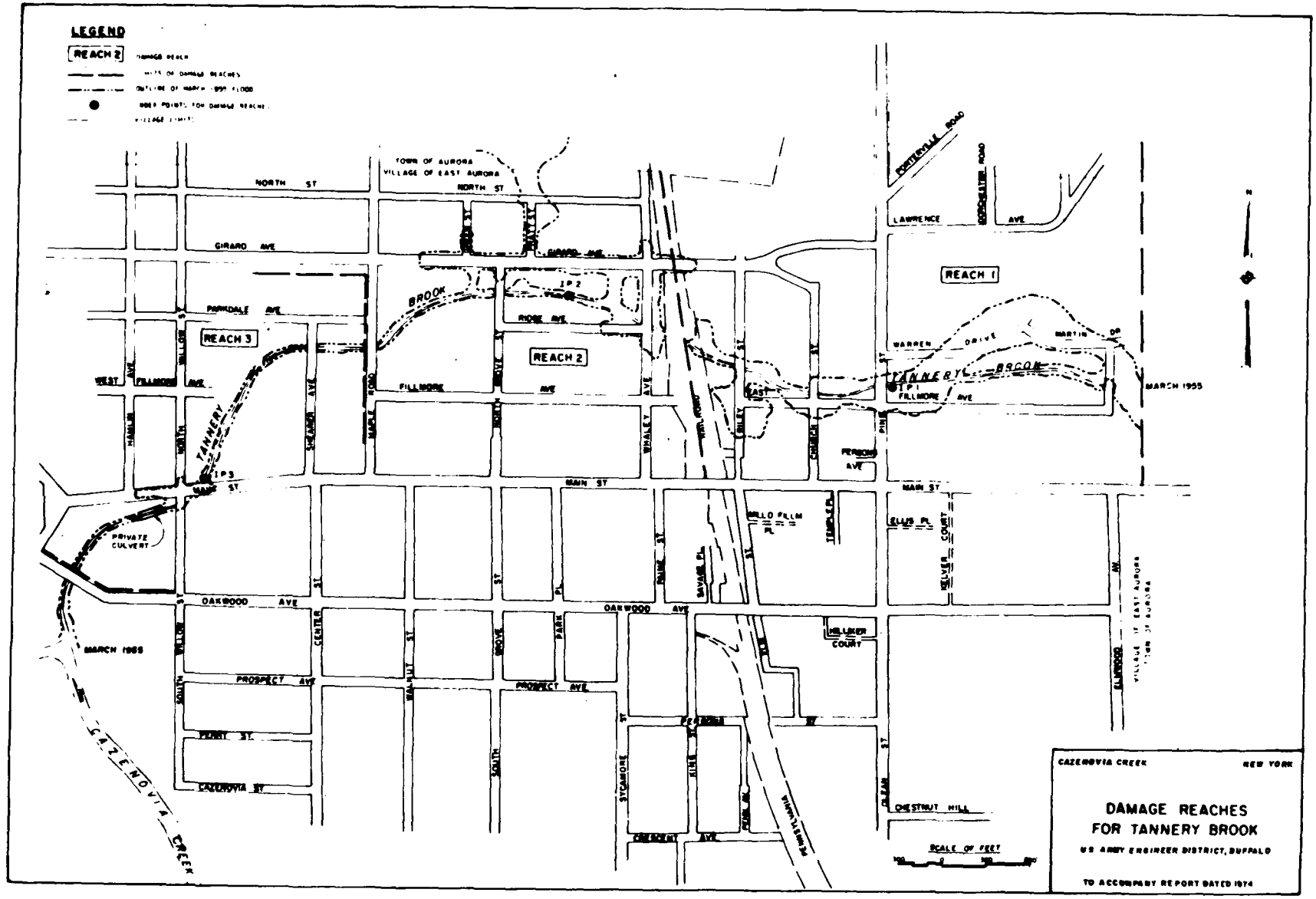
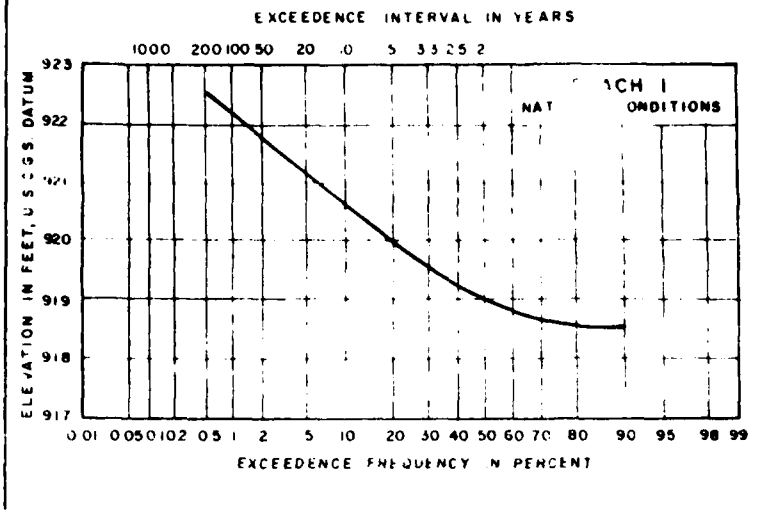
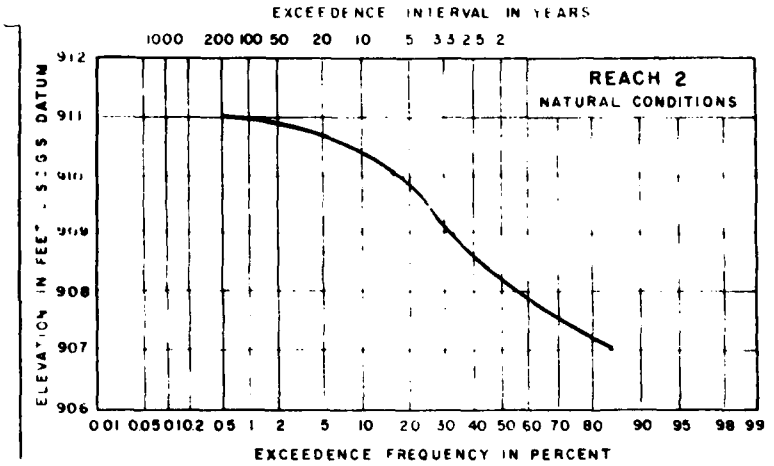
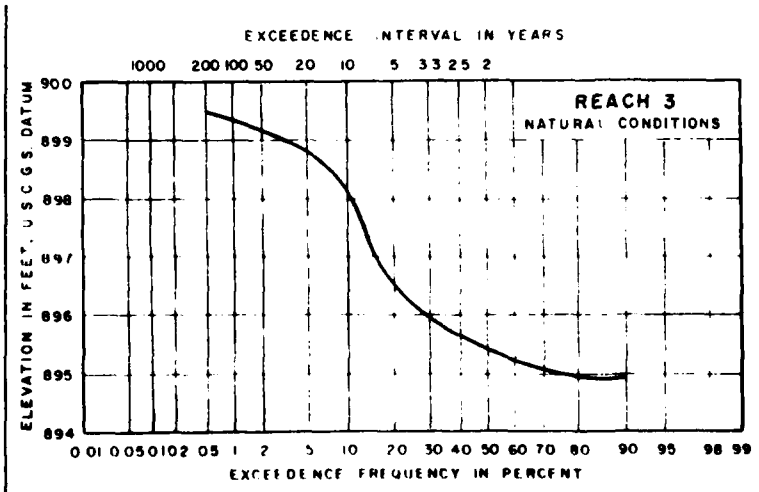

LEGEND
REACH 2
REACH 1
REACH 3
REACH 2
TOWN OF AURORA
VILLAGE OF EAST AURORA
NORTH ST
GIRARD AVE
PARKDALE AVE
RIDGE AVE
FILLMORE AVE
MAIN ST
OAKWOOD AVE
PROSPECT AVE
PERRY ST
CAZENOVIA ST
CAZENOVIA CREEK
TANNERY BROOK
PRIVATE CULVERT
MARCH 1955
MARCH 1965
IP 1
IP 2
IP 3
LAWRENCE AVE
ROCHESTER ROAD
CENTERVILLE ROAD
WARREN DRIVE
MARTIN DR
ELLIS PL
HILLAKER COURT
CHESTNUT HILL
PENNSYLVANIA
SCALE OF FEET
CAZENOVIA CREEK NEW YORK
DAMAGE REACHES
FOR TANNERY BROOK
US ARMY ENGINEER DISTRICT, BUFFALO
TO ACCOMPANY REPORT DATED 1974

PLATE 24







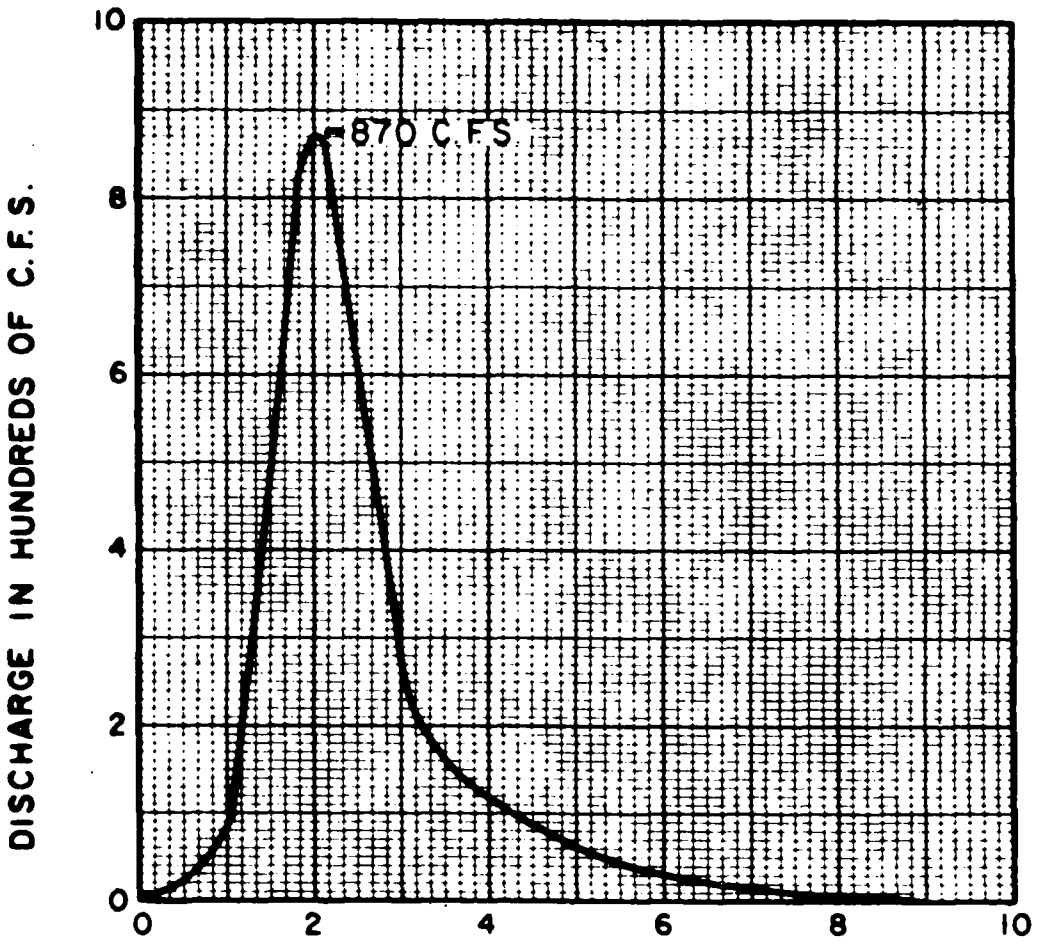
CAZENOVIA CREEK NEW YORK

STAGE-FREQUENCY CURVES FOR TANNERY BROOK

U S ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1974

PLATE 25



NOTES

DA = 22 SQ MI
C_t = 100
640Cp = 600

CAYUGA, BUFFALO, AND CAZENOVIA CREEKS

SYNTHETIC
1-HOUR UNIT HYDROGRAPH
FOR TANNERY BROOK
NEAR EAST AURORA

U S ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1974

PLATE 26

facilities; flood-fighting costs; cleanup costs; business losses; and increased operating and living costs during a flood. Intangible losses include the social, psychological, and health problems that are associated with flooding.

2.211 Tangible damages and losses for the major damage areas along the lower portion of Cazenovia Creek were quantified by developing stage-damage relationships based on data from various sources, including damage surveys conducted by the Corps of Engineers in 1960 and twice in 1972. The damage categories used are described below.

2.212 Residential damages include inundation losses to all residences and appurtenant structures including building contents and damage to grounds. Cost of emergency quarters due to flooding is also included.

2.213 Commercial damages include physical losses to properties and facilities used for retail trade, servicing, and entertainment. All other business pursuits are also included except for industrial activity. In addition to physical damages, losses sustained by activities consequential to floods such as loss of wages and increased costs of normal operation resulting from evacuation, cleanup, and reinstallation were also incorporated into the damage survey.

2.214 Industrial physical damages include flood damages to properties and facilities used in manufacturing, extracting, utility production, warehousing, transportation, and production distribution. Other losses include costs in addition to normal operating costs, such as evaluation cleanup, and reinstallation. Wage and profit losses sustained were also incorporated in the damage survey. However, due to the scarcity of industrial areas along Cazenovia Creek, this category was combined with the commercial category and considered as one.

2.215 Public and other damages include all costs associated with physical flood losses to public facilities such as schools, and municipal buildings as well as plant facilities such as sewer, water, road, and park systems. Other losses to the public include additional costs incurred during flood emergencies such as evacuation and reoccupation; flood fighting; disaster relief, and extra duty for police, fire and martial units.

2.216 Note that care has been taken to exclude non-recurring flood damages (i.e.; destruction of a building which is not replaced) from primary flood damage compilations and the resulting average annual damages. The results of this survey were used to develop the stage-damage relationship for each subreach at its selected index point (Plate 27). Table 33 presents data developed by combining the curves in Plate 27 with appropriate stage-discharge and discharge-frequency relationships. A similar analysis conducted for Tannery Brook using stage-damage relationships based on damage surveys by the Soil Conservation Service in 1956. This damage survey data was updated for recent developments and adjusted to present price levels. These results are shown on Plate 28 and in Table 34.

2.217 Extent and Characteristics of Flooded Area

2.218 Most large runoff events along Cazenovia Creek are caused by runoff from rapid thawing of snow cover in spring coupled with rainfall. The steeply sloping terrain in the upper watershed and the steep thalweg of the creek cause rapid runoff and abruptly fluctuating flows as shown by the unit hydrograph. The upper portion of the basin experiences comparatively little flooding and, when flooding does occur, the limited development results in relatively few flood damages. By contract, in the lower portion of the basin, flat slopes, low channel banks, restricted and meandering channels, and constricted bridge openings result in considerable flooding, which causes substantial damages to the extensive residential and commercial developments. Ice jamming further reduces channel capacity in the lower basin and contributes to flooding. The worst flooding occurs in the reach from downstream of the Cazenovia Street Bridge in Buffalo to upstream of the Mill Road Bridge in West Seneca. Flooding along Tannery Brook causes damages in East Aurora.

2.219 As discussed previously, the primary damage area, located in the lower basin, was divided into reaches and subreaches (see Table 32 and Plate 2) to facilitate flood damage analyses. Subreach 1A extends from the Buffalo River to Cazenovia Street Bridge. The most damaging flood of record in this reach occurred in 1959. Extensive damage occurred to residential development on the left floodplain between Portland and Cazenovia Street. Basement flooding due to overland flow and storm sewer backup is a frequent occurrence.[1] In this subreach, a discharge with a 100-year recurrence frequency would affect 1516 residential units, including first-floor flooding; 108 commercial units, with first-floor flooding; and 10 public and other units, three of which would experience first-floor flooding.

2.220 Subreach 1B extends from the Cazenovia Street Bridge to the New York State Thruway and includes Cazenovia Park. The 1959 flood resulted in an average depth of three feet on Abbott Road between Cazenovia Street and Potters Road. Located within this area and on the south side of Abbott Road are residential developments, a hospital, and a school. Except for residential developments between Woodside and Brookside Avenues north of Potters Road, the area of this subreach between Cazenovia Creek and Abbott and Potters Road is undeveloped and, therefore, the average annual damages are small.

2.221 Residences on Beyer and Willink Streets and Wildwood Avenue residence yards just downstream of the Lehigh Valley Railroad have been damaged by flooding. In this reach, the 100-year flood would affect 212 residential and 20 commercial units, causing first-floor flooding in eight of the commercial units.

Table 33

Stage-, Discharge-, and Frequency-Damage Data
For Cazenovia Creek Subreaches Under Existing Conditions

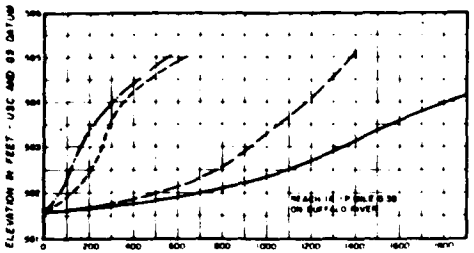
Subreach Index Point	Elevation at which Flood Damages Begin, Ft. Above Sea Level	Free Flow Conditions: Maximum Nondamaging Discharge, cfs	Free Flow Conditions: Average Return Period Between Damaging Floods, Years	Free Flow Conditions: Total Average Annual Flood Damages $/Year (1)	Maximum Nondamaging Discharge, cfs	Average Return Period Between Damaging Floods Years	Total Average Annual Flood Damages, $/Year (1)
1A	581.6	33,000(2)	30	50,500(3)	33,000	30	66,400(4)
1B	592.2	15,200	55	1,300	9,000	15	9,500
2A	597.2	11,000	10	400	1,300	2.5	12,400
2B	616.1	7,000	2	1,600	7,000	2	1,700
3A	619.3	15,400	60	100	12,800	35	100
3B	628.3	17,000	125	100	1,700	3.1	96,100
3C	635.0	13,200	25	200	1,800	2.5	9,300
				54,200			195,500

1. Based on October 1973 price levels

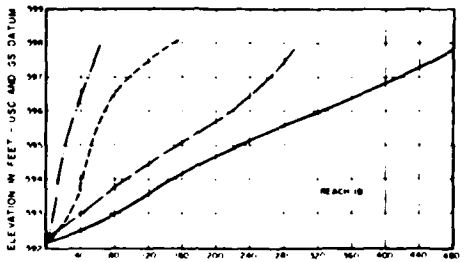
2. Buffalo River at confluence with Cazenovia Creek

3. Although the frequency of flooding along this reach is only once in 30 years, flooding is so widespread that total damages are extensive, as this amount reflects

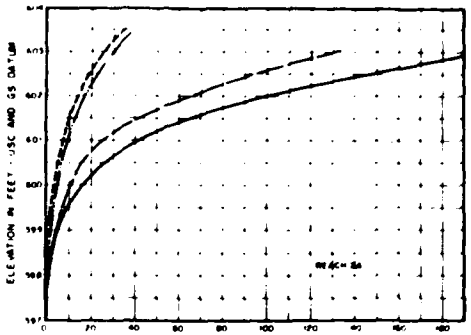
4. Includes $15,900 in annual costs for ice patrols by the City of Buffalo in Subreach 1-A



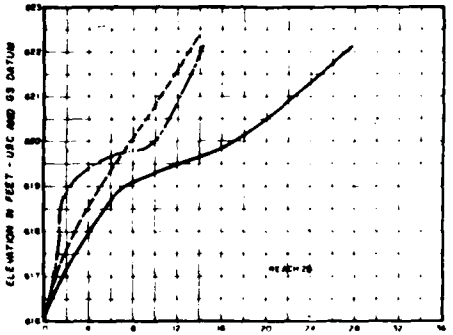
INDEX POINT ON BUFFALO RIVER IMMEDIATLY DOWNSTREAM FROM MOUTH OF CAZENOVIA CREEK AT BUFFALO RIVER MILE 5.38



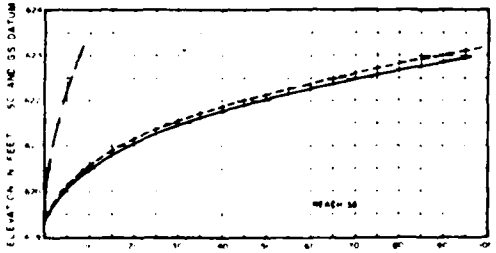
INDEX POINT 1B AT 82+00



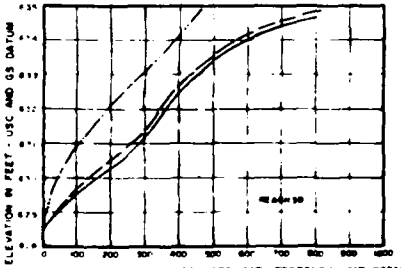
INDEX POINT 2A AT 130+00



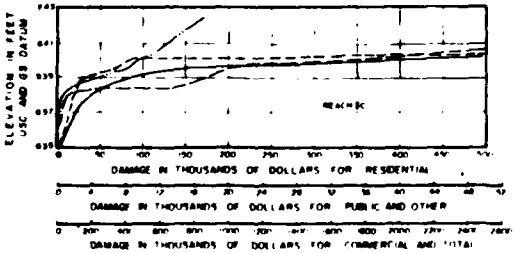
INDEX POINT 2B AT 211+50



INDEX POINT 3A AT 214+00



INDEX POINT 3B AT 275+50



INDEX POINT 3C AT 308+00

LEGEND

JAN. 1975 PRICE LEVELS FOR DAMAGES EXCEPT 3B AND 3C WHICH ARE AT JAN. 1978 PRICE LEVELS

CAZENOVIA CREEK NEW YORK

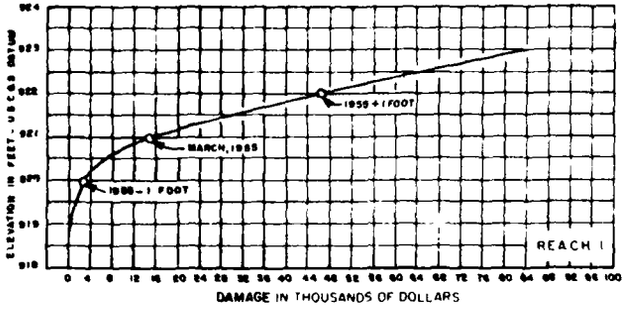
STAGE-DAMAGE CURVES FOR CAZENOVIA CREEK

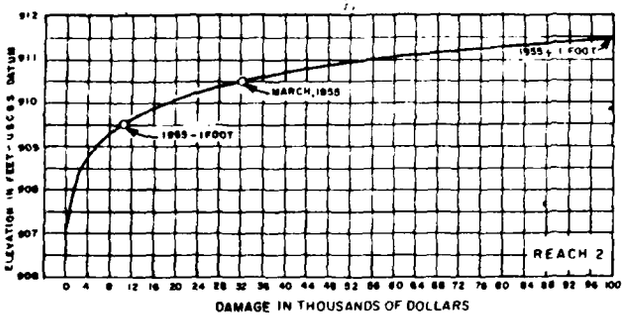
U.S. ARMY ENGINEER DISTRICT, BUFFALO

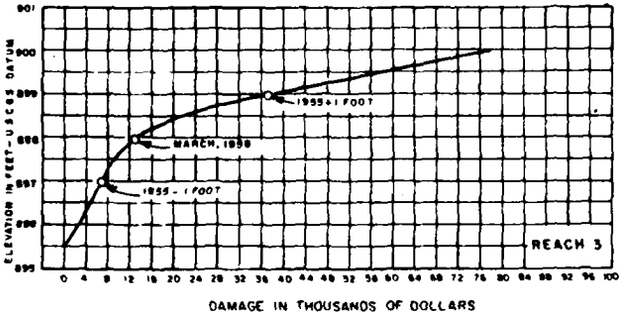
TO ACCOMPANY REPORT DATED 1974

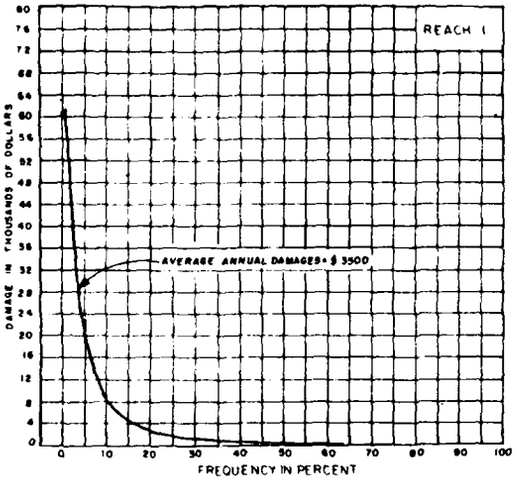
PLATE 27

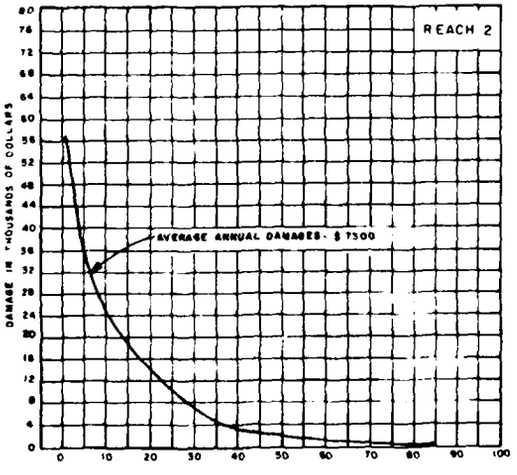
-27-

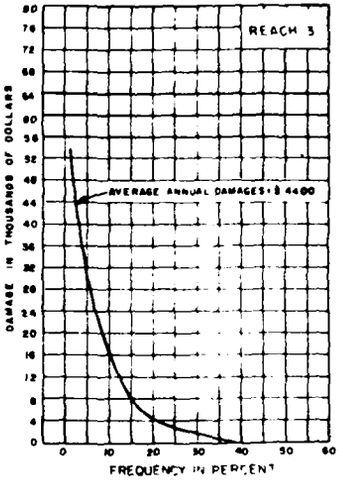












NOTES

INDEX POINT LOCATIONS

REACH 1 - UPSTREAM SIDE OF PINE STREET BRIDGE
REACH 2 - 580 FEET DOWNSTREAM OF WHALEY STREET BRIDGE
REACH 3 - UPSTREAM SIDE OF MAIN STREET BRIDGE

ALL VALUES SHOWN ARE ON THE JANUARY, 1973 PRICE LEVEL AND CONDITIONS OF DEVELOPMENT AT THE TIME OF THE DECEMBER, 1963 SURVEY

LEGEND

1988 STAGE AND ESTIMATED DAMAGE FROM FLOOD

1989 + 1 FOOT ESTIMATED DAMAGE FOR FLOOD 1 FOOT HIGHER THAN 1955 FLOOD

CAZENOVIA CREEK NEW YORK

STAGE-DAMAGE AND DAMAGE-FREQUENCY CURVES FOR TANNERY BROOK

U S ARMY ENGINEER DISTRICT, BUFFALO

TO ACCOMPANY REPORT DATED 1974

PLATE 28

Table 34

Stage- and Frequency-Damage Data
For Tannery Brook Under Existing Conditions

Reach Index Point	Elevation at which Flood Damages Begin, ft. above sea level	Corresponding Return Period, years	Average Annual Flood Damages, $/Year*
1	918.8	Approx. 1	3,700
2	907.2	Approx. 1	7,700
3	895.5	2	4,600
			16,000

* Based on October 1973 price levels

2.222 Subreach 2A extends from the New York State Thruway Bridge to Orchard Park Road Bridge. The left floodplain of this reach includes residential development, but the right floodplain is undeveloped. The 100-year flood would affect 132 residential units, with three receiving first-floor flooding; five commercial units, two of which would suffer first-flood flooding; and one public or other unit.

2.223 Subreach 2B extends from Orchard Park Road Bridge to Ridge Road Bridge. This reach includes largely undeveloped floodplains and most flood damage occurs to commercial units and public utilities. The 100-year flood would affect two residential and two commercial units, causing first-floor flooding in all four.

2.224 Subreach 3A extends from Ridge Road Bridge to just downstream of Parkside Drive in West Seneca. In this area the floodplain is largely undeveloped and the 100-year flood would affect only six commercial units causing first-floor flooding in all.

2.225 Subreach 3B extends from just downstream of Parkside Drive to just upstream of Singer Drive. The right floodplain in this area is fully developed for residences, some of which are flooded annually. The 100-year flood would affect 202 residential units, and cause first-floor flooding in 47. A high bluff on the left bank prevents flooding in this area.

2.226 Subreach 3C extends from upstream of Singer Drive to upstream of Mill Road. In this reach a bluff forms the left bank of the channel.

Southgate Shopping Plaza has been constructed between Singer Drive and Union Road in the right floodplain. The right bank has been raised and protected in the same area. However, a flood the size of the 1959 flood would inundate the parking area around the plaza and flood the first floors of all stores. Above Union Road a residential development occupies the right floodplain and units adjacent to the channel are occasionally flooded. In Subreach 3C, the 100-year flood would affect 149 residential units, causing first-floor flooding in 15; and would cause business losses to Southgate Plaza Stores.

2.227 Above Mill Road, Cazenovia Creek flows in a well-defined channel. There are scattered developments in the floodplain up to the village of Spring Brook. Between Spring Brook and East Aurora, the creek flows through a gorge in which there is virtually no development. Between East Aurora (where the East and West Branches join) and the hamlet of Griffin Mill, the West Branch of the creek flows in a deeply incised channel having a steep rock bank on one side and a more gently sloping till alluvium bank on the other. No significant flood damage has been reported in this area. Upstream of Griffin Mills the channel is not so deeply incised and development has occurred along the banks, especially above Colden. Flooding along this stretch of the creek was reported in September 1967 and residential and commercial properties adjacent to the creek suffered flood damages. Other damages include highway washouts and downed power lines. This flood affected one public, one commercial, and 10 residential units in West Falls; six residential, one public and three commercial units in Colden; and two residential units in Glenwood. The East Branch flows through a valley and most development is high enough to avoid flooding, with only isolated residences close enough to the creek to be flood prone. Although a County highway bridge in the Town of Holland was damaged during the September 1967 flood, recent floods have caused no repeated damages to private property along this stretch.

2.228 Future Flood Damages

2.229 Due to recent and pending Federal, State, and local legislation directed at controlling future use and development of floodprone areas, flood damages were not projected to increase due to future encroachments on the floodplain. On the contrary, control of future floodplain development could result in an eventual decrease in physical flood damages as existing residential and commercial properties become obsolete and are replaced by developments that are floodproofed or associated with uses compatible with a floodprone location.

2.230 This possible decrease in physical damages might be offset, however, by improvements to existing developments. For instance, as residents experience continued growth in income, a part of this growth will be invested in home improvements involving the structure, the contents, or both. Similarly, industrial and commercial establishments wishing to increase production or sales will expand their facilities and invest in additional equipment.

SECTION 3

3. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

3.01 The Buffalo District Corps of Engineers requested eight public planning agencies, which have particular interest in the West Seneca area, to evaluate the relationship of the proposed flood control improvements on Cazenovia Creek to their respective land use plans for the project area. The planning agencies were requested to analyze potential areas of compatibility or conflict between the proposed project and the objectives and specific terms of existing or proposed land use plans, policies, and controls, if any, that may have been formulated for the project area. Types of plans considered included master plans, zoning regulations, plans developed in response to the Clean Air Act and Federal Water Pollution Act Amendments of 1972, and other related land use proposals.

3.02 Agency Proposed Project Reviews

3.03 The New York State Parks and Recreation office noted that an area on Cazenovia Creek, just upstream of the proposed project, has been considered for acquisition and development of a State park. Since the potential State Park Acquisition Area is upstream of the proposed ice retention structure, the Corps is proceeding with its plan for flood control on Cazenovia Creek. The Parks and Recreation office also asked the Corps to consider the feasibility of a continuous trail system, which would utilize any levees and banks along Cazenovia Creek in the improvement proposal. Every consideration would be made in design of the flood control project to permit public use for a trail system.

3.04 The following land use planning agencies were contacted but did not reply to the Corps' request:

State Office of Planning Services
Erie-Niagara Regional Planning Board
U. S. Department of Housing and Urban Development
Erie County Department of Planning
West Seneca Town Planning Board
West Seneca Town Zoning Board
Office of Planning and Development

SECTION 4

4. THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

4.01 Summary of Proposed Plan

4.02 The proposed plan recommends floodplain management and participation in flood insurance programs as means of controlling floodplain encroachment and lessening the potential impact of future flooding. To alleviate flood damages to existing development in West Seneca, an ice retention structure upstream of Reach 3 is proposed. No other structural measures are recommended for any other damage reach in the Cazenovia basin.

4.03 Transient Impact

4.04 Included here are all construction-related disturbances which will cease upon completion of the project. Construction activities will be planned to minimize the impact on existing vegetation and wildlife. The specifications for the project contract will contain provisions for environmental safeguards, including proper layout and construction of project plant facilities; landscape preservation; controls of air, water, and noise pollution; and other factors necessary to minimize degradation of the project site and to require restoration of contractor caused environmental damage as feasible. Measures to control soil erosion will be undertaken. These will include: salvage, protection and reuse of topsoil, use of temporary and prompt vegetative measures, use of mulches, and use of lime and fertilizer, as needed, to establish protective vegetation. Air and water pollution restrictions will be based upon guidelines for the specific project area obtained from the regional offices of the Environmental Protection Agency and the responsible state agencies, prior to preparation of the specifications.

4.05 Despite these precautions, construction on stream banks and channels will involve certain unavoidable impacts. Turbidity will be increased, temporarily driving away fish and other organisms and possibly causing other damage of a more lasting nature (see Section 4.06). Certain residents invariably will be annoyed and inconvenienced by the usual disturbances attending heavy construction. Noisy earthmoving equipment will kick up dust and mud, and emit exhaust fumes and smoke. However, because of the rather isolated location of the proposed structural works, few individuals will actually experience such annoyances.

4.06 Lasting Impact

4.07 This section discusses those effects which can be expected to last for at least, and in some cases beyond, the approximate 100-year useful life of the project.

4.08 Lasting Environmental Impact

4.09 The proposed plan provides for the construction of a concrete ice retention dam spanning Cazenovia Creek approximately 1,000 feet east of the Main Street-Seneca Street intersection in West Seneca. This structure (see Plate 4) would extend some 900 feet in length, with a base width of 20 feet. The heights of the lower and upper weirs would be respectively 10 and 18 feet above the channel bottom with wingwalls extending another 13 feet above the upper weir, tying into the valley slopes on either side of the creek. A 5-acre ice area would be excavated immediately behind the dam for the stilling pool. When the stilling pool is formed, backwater effects would extend over another 6 acres of natural creek channel. When these gates are opened, normal summertime flows would pass through the structure without any noticeable backwater effect.

4.10 The ice retention structure is likely to have a mixed effect upon streamlife and water quality in Cazenovia Creek. Increased siltation due to construction may smother sessile or slow-moving organisms downstream, and in addition disrupt spawning beds. This process would lower productivity downstream. Should local interests decide to maintain a permanent pool, increased depth may increase productivity locally upstream. At present, creek productivity is thought to be limited by extreme shallowness--nutrient levels are thought sufficient to support algal blooms in the main stream (see Section 2). Increased productivity and depth in such a permanent pool might support sizable populations of small game or panfish, such as sunfish, perch, or even bass. However, if the pool is drained as planned, productivity may not increase as greatly and may be unaffected.

4.11 The proposed plan will involve draining the stilling pool for the late summer, fall and early winter months. The drain culverts would be low level structures with inverts near the creek thalweg. If a permanent pool were to be provided, its lower waters might stagnate; such water could be drained by opening the drain culvert gates. The pool may stagnate only under relatively extreme conditions: a combination of flourishing algal and consumer populations coinciding with an extended period of hot, dry, calm weather. Although such a pool would be somewhat sheltered by its location, prevalent climatic conditions (especially wind) favor a degree of mixing adequate to forestall stagnation. Nevertheless, it is recommended that either drainage of the pool be restricted to cooler windy periods or no pool be allowed to form when conditions favorable to stagnation occur.

4.12 Floodplain management provisions of the project are of potential benefit to the aquatic ecosystem of Cazenovia Creek. By controlling basin growth and floodplain encroachment, floodplain management serves to perpetuate the natural state of the creek and primary floodway and eliminate the necessity of environmentally costly structural measures for flood protection at a later date.

4.13 Approximately 15 acres of lowlying scrubland would be cleared during construction of the ice retention structure, including 5 acres for the proposed stilling pool. Ice scour could damage trees and shrubs on approximately an additional 50 acres. Beyond the 5 acres excavated behind behind the dam, the creek would be confined to its channel, although its depth would be increased. The land inundated harbors a variety of small bird, amphibian, reptile, and mammal species. Common among these are various songbirds, pheasant, leopard frogs, spotted newts, cottontail rabbit, skunk, opossum, and numerous small rodents. Displaced vegetation includes trees such as black willow, eastern cottonwood, and boxelder; and shrubs such as mulberry, wild grape, and staghorn sumac. It is expected that displaced animals will migrate into adjacent scrubland areas during the construction phase.

4.14 Floodplain management provisions of the proposed project would help perpetuate the natural state of the floodway. Furthermore, recreational development compatible with the tenets of floodplain management would preserve productive or otherwise valuable stretches of creek frontage. Approximately 40 square miles of land near the creek would be so effected.

4.15 Lasting Socioeconomic Impact

4.16 It is anticipated that no existing industrial or commercial activity and public service would be disrupted. No homes or farmsteads would require relocation. Only one man-made structure - an abandoned warehouse - would be relocated. Inundation rights would have to be obtained for about 20 acres of potential agricultural land; there would be no significant loss of tax revenues.

4.17 The proposed structural flood control measure would reduce the potential threat of flooding and its consequences in reaches 1 through 3. These include traffic and emergency service disruptions, physical injury and property damage, threats to public health and safety due to flood-borne infectious agents and vermin, disruption of commercial activity, and lowered property values in flood prone areas. See Section 4.27 for a detailed description of flood damage reduction benefits. Floodplain management would reduce the damage potential of future floods.

4.18 The vicinity of the ice retention structure could be incorporated into a larger parkland-recreational complex, perhaps including Mill Road Park. Should local interests decide to maintain a permanent pool, this reach of Cazenovia Creek might prove attractive for boating, canoeing, and/or fishing.

4.19 Floodplain management programs, if prudently implemented, should consider conversion of high-risk flood areas into open park lands, or at

least check the spread of suburban development in these areas until such time as their recreational value can be ascertained.

4.20 Aesthetic Impact

4.21 The ice retention structure would alter the existing environmental setting in the project area, giving it a man made appearance. However, to help mitigate the aesthetic impact, the construction site would be restored by grading and mulching of slopes and reuse of stripped topsoil, to establish proper grasses and other vegetation adaptable to soil and climatic conditions in the area.

4.22 Archaeological Impact

4.23 Archaeological sites are known in West Seneca, and it is possible that one or more of these may occur at the structure's dam site above Reach 3. In this case, disruption or destruction of such sites might occur. Based upon the results and recommendations of a preconstruction field survey by professional archaeologists, the need for salvage or preservation of any significant archaeological sites will be determined.

4.24 Impact on Flooding

4.25 The primary benefits of the recommended ice retaining structure would be the reduction in average annual damages along Cazenovia Creek from $228,700 to $75,300. These values are based on October 1972 level of development and October 1974 price levels. See Plate 2 for location of damage reaches.

4.26 The above reduction in flood damages would be the result of lowering the floodwater levels in those reaches where ice jamming usually occurs. On Plate 21 the ice-affected stages and the free flow (no ice present) stages are shown. The effect of removal of the ice by the ice retaining structure can best be noted in Subreach 3B. For example, in Subreach 3B with ice present there is a 1 percent chance each year that the water level would reach 633.3 feet; whereas, if the ice retaining structure were provided, the level would only be 628.2 feet.

4.27 Damage Reduction By Reach

4.28 There would be very little flood damage reduction in Subreach 1A because the ice stages and free flow stages are the same. Most flooding damage in this reach is due to basement flooding and has resulted from a combination of overland flow and storm sewer backup. High water stages in Cazenovia Creek in this area are usually a result of backwater effects from Buffalo Creek, not ice jamming on Cazenovia Creek. However, the need for the City of Buffalo to continue ice breaking activities in this reach could be eliminated by construction of the ice retention structure.

4.29 In Subreach 1B, the 1 percent flood stages are reduced 3 feet by the ice retention structure.

4.30 In Subreach 2A, the water level that has a 1 percent chance of occurring each year would be reduced by 3 feet following construction of the recommended ice retention structure or the chance of flood damage occurring each year has been reduced from 40 percent to approximately ten percent.

4.31 Subreach 2B consists largely of low, undeveloped floodplain. Most damage occurs to commercial units and public utilities. The ice retention structure would not significantly decrease the flood levels and average annual damages in this reach.

4.32 Subreach 3A is similar to Subreach 2B, i.e., low largely undeveloped land. The average annual damages in this area are less than $100 under existing conditions. The ice retention structure would reduce flood levels somewhat in this reach.

4.33 In Subreach 3B, as noted earlier, the ice retention structure would reduce the flood stages over 5 feet for a 1 percent probability flood. This large reduction in flood stages reduces the average annual damages from in excess of $104,000 to approximately $100 based on October 1974 prices and mid-1972 level of development. The chance of a damaging flood level occurring each year has been reduced from greater than 30 percent to less than 1 percent.

4.34 Substantial benefits also occur in Subreach 3C where the Southgate Plaza is located. The chance of water level reaching the Plaza parking area or the houses upstream of Union Road would be reduced from 40 percent to 4 percent on an annual basis. The accompanying reduction in average annual damages is approximately $10,000.

4.35 The degree of protection provided by the ice retention structure and the remaining average annual damages are shown on Table 35.

Table 35

Damage Reduction and Levels of Protection Provided
By Ice Retention Structure

Subreach Index Point	Existing Damages $/Year	Residual Damages with Ice Retention Structure $/Year	Existing Average Return Period Between Damaging Floods, Years	Average Return Period Between Damaging Floods, Years
1A	66,400	66,400	30	30
1B	9,500	1,300	15	55
2A	12,400	400	2.5	10
2B	1,700	1,600	2	2
3A	100	100	35	60
3B	96,100	100	3	125
3C	9,300	200	2.5	25

SECTION 5

5. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

5.01 Construction Effects

5.02 Regardless of the degree of caution and restraint exercised by the contractor, construction activity will cause environmental disturbances. In the summer there will be dust; in the winter there will be mud. Noise and exhaust fumes from use of heavy equipment will occur throughout the duration of project construction.

5.03 Vegetation and Habitat

5.04 Approximately 36 acres would be disrupted by construction activity or periodic flooding - this would include: 1 acre for the dam site; 5 acres excavated for the stilling pool; 20 acres subject to periodic flooding; 10 acres cleared, grubbed and restored by grading and planting.

5.05 It is estimated that about 65 acres would be subject to potential ice scour above the dam. This would include the aforementioned 5 acres excavated for the stilling pool; 10 acres cleared, grubbed and restored by grading and planting, and an additional area about 50 acres in size east of the dam.

5.06 Effect on Water Quality

5.07 Should local interests decide to maintain a permanent pool, an increase in algal biomass might occur. During the summer, such conditions could cause fouling of the pool and downstream reaches.

5.08 Archeological Impact

5.09 The Buffalo District, Corps of Engineers conducted a cultural resource reconnaissance study of the proposed Cazenovia Creek project area, including the proposed ice retention structure site and stilling pool area, in September 1975. The study, which included literature research and a field reconnaissance, was under the direction of a Corps archaeologist working in cooperation with the New York Archaeological Council.

5.10 An examination of records and maps on file at the State University of New York at Buffalo, and at the office of the New York State Archaeologist in Albany, indicated that there are no known prehistoric cultural resources in the proposed project area.

5.11 Ms. Kathy Miller, an archaeologist associated with the State University of New York at Buffalo, was the study's principal investigator during the 24-25 September 1975 field reconnaissance of the project area. As a result of the field work, two sites in the proposed project area were located and inventoried. One site was designated as a possible aboriginal site because of the discovery of a core module of indigenous flint and a scatter of associated flakes. A second site was described as a possible historic site in the form of a small structure of unknown age with an association of concentrated non-indigenous fruit trees. These features may mark the location of possible former historic sites associated with the occupation of the Buffalo Creek Indian Reservation by the Iroquois during the late eighteenth and early nineteenth centuries.

5.12 Upon Congressional authorization for advanced engineering and design work on the proposed project, a survey level cultural resources study of the proposed project area and area of potential environmental impact will be conducted as recommended by the principal investigator. The survey study will be conducted according to a scope of work based on the principal investigator's recommendations, a preliminary ethnohistoric report submitted to the Buffalo District by Dr. Marian White (1974), and an ethnohistorical and archaeological proposal for additional study by Thomas King (1975). This scope of work will include guidelines for an ethnographic study of the immediate proposed project area (ice retention structure and stilling pool) and the downstream area of potential environmental impact that would be protected by the proposed project. The scope of work will also specify the cultural resource survey's research guidelines for site evaluations and application of the National Register criteria as publised in the 25 January 1974 Federal Register (39 FR 3366), and codified in the proposed Corps regulation that appeared in the 8 September 1975 Federal Register (33 CFR, Part 305). The survey's results will be used to formulate a cultural resource mitigation plan, which could include realignment of project features to preserve any significant resources that may be present.

5.13 Historic Resources

5.14 Correspondence from the New York State Office of Parks and Recreation, Division of Historic Preservation, dated 10 March 1975, indicated that "the birthplace of Millard Fillmore was recently named a National Historic Landmark, and is therefore listed on the National Historic Register of Historic Places." This historic landmark is located in East Aurora, NY, about 7 miles southeast of the proposed ice retention structure site.

SECTION 6

6. ALTERNATIVES TO THE PROPOSED ACTION

6.01 Development of Flood Control Alternatives

6.02 Table 36 depicts the method used to formulate viable alternative flood control plans from which the recommended plan of action was chosen. Considered flood control measures are discussed below. See Appendix D for pertinent economic data.

6.03 Floodproofing

6.04 Floodproofing measures were found to be economically viable in Reach 3 and hence eligible for inclusion in an alternative plan. Elsewhere in the basin, floodproofing was found to be economically unjustifiable.

6.05 Local Protection

6.06 Levees were considered for individual reaches of the lower basin. Only one levee, protecting Reach 3 was found to be economically viable.

6.07 Channelization

6.08 Channelization was found to be economically and environmentally unjustifiable as a primary flood control measure.

6.09 Floodplain Management and Flood Insurance

6.10 Floodplain management and participation in flood insurance programs are considered to be desirable adjuncts to any flood control program and are therefore highly recommended.

6.11 Diversion Channels

6.12 Diversion of floodwaters from Cazenovia Creek to Smokes Creek was rejected due to the insufficient capacity of Smokes Creek. Diversion of floodwaters from Tannery Brook to a tributary of Buffalo Creek was rejected as economically unjustifiable and of possible effect on flooding along Buffalo Creek.

6.13 Culvert Widening

6.14 Culvert widening would only be effective along Tannery Brook. However, such measures were rejected as economically unjustifiable.

Table 36

FLOW CHART FOR DEVELOPMENT OF FLOOD CONTROL PLANS

STEP 1	Identify all plausible individual flood control measures.	
		Implausible measures are rejected.
STEP 2	Conduct preliminary qualitative screening of measures on basis of engineering practicability, social acceptability, economic feasibility, capability of providing adequate solution to flood problems, etc.	Impracticable, unacceptable, infeasible, and inadequate measures are rejected.
STEP 3	Identify remaining individual measures and/or reasonable combinations of remaining measures that will protect individual damage areas or series of damage areas.	
STEP 4	Determine economic feasibility of identified individual measures and/or combinations of measures.	
		Infeasible measures and combinations of measures are rejected.

Table 36 (cont'd)

FLOW CHART FOR DEVELOPMENT OF RECOMMENDED PLAN

STEP 5	Develop alternatives for the basin, each alternative consisting of a set of compatible measures and/or combinations of measures that would provide a coordinated basinwide flood control program.	
STEP 6	Analyze each alternative on the basis of national economic development, environmental quality, social well-being, and regional development; best alternative becomes the selected plan.	Less attractive alternatives are rejected.
STEP 7	Develop recommended plan by formulating the selected plan for scale of development.	

6.15 Reservoirs and Impoundments

6.16 A flood control reservoir near Spring Brook was considered to be an effective measure, but was rejected as economically unjustifiable. Small flood retention ponds in West Seneca and East Aurora were rejected as environmentally, aesthetically and economically unsound. An ice retention impoundment reservoir found to be both effective and economically viable.

6.17 No Action by Corps of Engineers

6.18 No action in the Cazenovia Creek Basin was rejected as counter-productive. It is felt that municipal and regionwide floodplain management programs might be delayed or discouraged without Corps support. Such action means that flood damage to floodplain lands and developments and resultant hardship and suffering to community residents would continue. Change of property ownership in the floodplain would continue, but selling of homes may be somewhat more difficult, with a resultant impact on home prices. Safety and health of communities in the floodplain would be jeopardized in the event of continued flooding. Flood damage to private lands and structures could reasonably be expected to continue; as a result, associated temporary adverse impacts such as relocation of affected families and disruption of transportation routes, utilities, commercial activities and employment could be expected. Lack of adequate flood protection would continue to create a feeling of community insecurity due to the potential flooding threat. Environmentally, soil erosion and siltation due to flooding would continue to cause some destruction and disruption of vegetation and wildlife habitat along the creek's banks. In addition, such future floods may even destroy or disrupt existing archaelogical sites in the floodplain, thereby precluding salvage or protection of such sites.

6.19 Alternative Flood Control Plans

6.20 Given 1972 development in the Cazenovia Creek Watershed, October 1973 prices, and the then prevailing amortization interest rate of 5-5/8 percent, four measures were identified as being sound and desirable from engineering, environmental, and economic standpoints: an ice retention structure in West Seneca, local protection in West Seneca, floodproofing structure in West Seneca, and floodplain management throughout the basin. Given current prices and the now prevailing interest rate of 6-7/8 percent, the considered local protection in West Seneca becomes unjustifiable, however, the plan providing for it is described in Alternative 1 for the purpose of comparison. The following alternative plans were formulated:

Local Protection in Reach 3 and Floodplain Management
(Alternative 1)

Floodproofing in Reach 3 and Floodplain Management
(Alternative 2)

Ice Retention Structure and Floodplain Management
(Alternative 3) - The Recommended Plan

No Action
(Alternative 4) - Discussed in paragraph 6.18.

The recommended plan is discussed in Sections 1 and 4. Descriptions and anticipated impacts of the alternative plans 1 and 2 are discussed in the following paragraphs.

6.21 Plan Description for Alternative 1

6.22 A plan of improvements for Alternative 1 is given in Plate 29. A levee parallel to Parkside Drive would be constructed from the high ground along Seneca Street parallel to the rear property line of residents along Parkside Drive and then east parallel to the right creek bank. This levee would continue upstream to join the high ground at the Southgate Shopping Plaza. The creek channel would have to be relocated along West Willowdale Drive near Parkside Drive to provide sufficient room for construction of the levee. Riprap bank protection would be provided as required along this section.

6.23 From the upstream end of the levee a three foot high floodwall would be constructed to Union Road. A sheet pile I-wall section would be used.

6.24 A 36-inch culvert would drain all of the runoff not entering the existing storm sewers from the 102 acre drainage area bounded by the considered levee, Union Road and Seneca Street. The culvert would be provided with a gatewell, sluice gate and flap gate. Ponding areas, behind the levee, would be provided to store runoff that occurs coincident with flood stages in Cazenovia Creek.

6.25 The drainage structure would be able to pass the runoff from a 50-year storm without causing any flood damage during low creek stages. Ponding area storage was used to modify the peak flow from the storm. In the event of high creek stages coincident with storm runoff, the ponding areas would contain the runoff from a 100-year, 6-hour storm, about 2.5 inches of runoff from the respective drainage areas. A runoff coefficient of 0.7 was used in all computations.

6.26 The existing storm sewers which cross the considered levee alignment would be provided with gatewells, each with a flap gate and a sluice gate. Aproximately 280 feet of 24-inch sanitary sewer, between stations 279+100 and 282+00, would require relocation to avoid crossing or running under the levee alignment by the Southgate Shopping Plaza. In addition, approximately 100 feet of the 18-inch sanitary siphon would be lowered under the relocated channel. Along with the sewer relocations, one manhole on the 18-inch siphon would have to be relocated. Thirty-four sanitary sewer manholes would have to be waterproofed to prevent water from entering and causing a backup.

6.27 After the relocations, the sanitary sewers would cross the levee alignment at two locations. At the point where the 18-inch sewers

cross the alignment, a gatewell with a sluice gate and an automatic shear gate would be provided. At the point where the 36-inch sewer crosses the levee alignment, a gatewell with a sluice gate and a flap gate would be provided. In the event of a rupture in the 18-inch sewer line leading into the protected area, the automatic shear gates would be needed so that they could be reopened after repair had been affected. If a break should occur in the sewer line which removes the sewage from the protected area, the flap gate, which would reopen of its own accord after repairs, would suffice.

6.28 Floodplain management provisions are identical to those of the proposed project. See Section 1.

6.29 Environmental Impact of Alternative 1

6.30 Alternative 1 would require the construction of 3,500 ft. of levee (top width 10 ft., base widths and height in some sections approaches 60 ft. and 10 ft. respectively) from Seneca Street parallel to the rear property lines of those residents living along Parkside Drive, and then east to join the creek bank; then a continuation of the levee along the north creek bank up to the Southgate Shopping Plaza. Along this stretch of the creek structural measures would also include approximately 1,400 ft. of channelization, 4,250 ft. of riprapping and 800 ft. of floodwall construction.

6.31 As in the proposed plan, construction would be attended by noise, exhaust fumes, and dust and mud. The existing ecology of the creek channel in the channelized construction zone will be disrupted. Although the stream here is extremely shallow and flows over exposed rock, construction activity in the creek bed will cause fish to temporarily move out of the aquatic area being disturbed. Also, disturbance of the streambed and adjacent banks by channelization will create temporary turbidity by increasing the amount of suspended solids in the creek. Such an effect might smother slow-moving or sessile benthic organisms.

6.32 Alternative 1 would require the disruption of 5 acres of land in the considered design path. Approximately 1 acre of this land supports large trees, chiefly black willow and eastern cottonwood. The average diameter of the larger trees is estimated to be 24 inches, with some up to 50 inches in diameter and over 100 ft. in height. These trees harbor many species of smaller birds and mammals. It is also possible that use of land behind the levees as temporary ponding areas would disrupt or alter its ecology, depending upon the size of the area inundated and the duration of submergence.

6.33 Aesthetically, the levee and floodwalls would intrude upon the natural creekside setting. The angular levee would block the residents' view of the creek. Loss of trees might be balanced by a careful program of landscaping, seeding and planting.

6.34 The socioeconomic impact of Alternative 1 would be quite similar to that of the proposed plan. Existing development in Subreach 3B would be protected against the 100-year flood. Flood stages upstream or downstream of the protective works would be unaffected. Floodplain management would promote prudent land use in Cazenovia Creek Basin, preserving areas of possible recreational value and reducing the potential for future flood damage.

6.35 Alternative 1 might involve the loss of Indian artifacts. As in the proposed plan, an archeological survey would be taken of the area to locate such artifacts, determine their worth, and salvage whatever is deemed valuable.

6.36 Plan Description for Alternative 2

6.37 Alternative 2 involves floodproofing in Subreach 3B. Floodproofing consists of modifications to structures to reduce flood damages. These modifications can be undertaken in existing buildings, or incorporated into new buildings at locations where studies have indicated that the new construction is a proper use of a floodplain. As floodproofing measures apply to specific structures and are often undertaken in existing buildings, they are generally the responsibility of an individual or organization. A floodproofing program would normally warrant consideration under the following circumstances:

a. Where construction of flood-control structures is not economically feasible or cause overriding adverse impacts;

b. Where effective functioning of an enterprise requires waterfront location;

c. Where flood insurance is allied to floodproofing;

d. Where floodproofing can complement flood-control projects.

6.38 There are many types of floodproofing measures which can be implemented depending on the circumstances encountered and the degree of protection desired. In general, floodproofing measures should:

a. Prevent water entering the building through underground sewer pipes. This is usually done by inserting backflow check valves in the main sewer line leading into a structure.

b. Prevent water entering the building from grade level. This is usually done by inserting watertight fittings in openings such as

basement windows, constructing small levees around the property, or raising the elevation of low areas around the building.

c. Construct all new buildings with first floor levels above flood level or raise existing buildings above flood level.

6.39 Floodplain management provisions of Alternative 2 would be identical to those of the proposed plan and Alternative 1.

6.40 Impact of Alternative 2

6.41 Floodproofing would have no ecological impact on the creek basin. Furthermore, floodproofing would not alleviate or reduce many flood hazards--streets would be flooded, traffic delayed, etc. From an economic standpoint, floodproofing would constitute an unwelcome financial burden to residents of floodprone areas. Even with Federal cost-sharing, residents would have to pay $200-$1,000 for such measures. Furthermore, aesthetic tradeoffs might well be necessary to achieve a desirable level of flood protection.

6.42 Floodplain management would have the same beneficial impact here as in the proposed plan and Alternative 1.

6.43 Cost Effectiveness and Alternative Plan

6.44 Alternative 1 was rejected bacause it becomes unjustifiable in light of current prices and the prevailing interest rate. Alternative 2 was rejected because it also offers a lower benefit/cost ratio (1.39 versus 2.06, given 1972 development, October 1973 prices, and an interest rate of 5-5/8 percent), and lower net benefits ($25,700 versus $72,700) and is furthermore strongly opposed by residents of Subreach 3B in West Seneca. See Appendix D for detailed cost data.

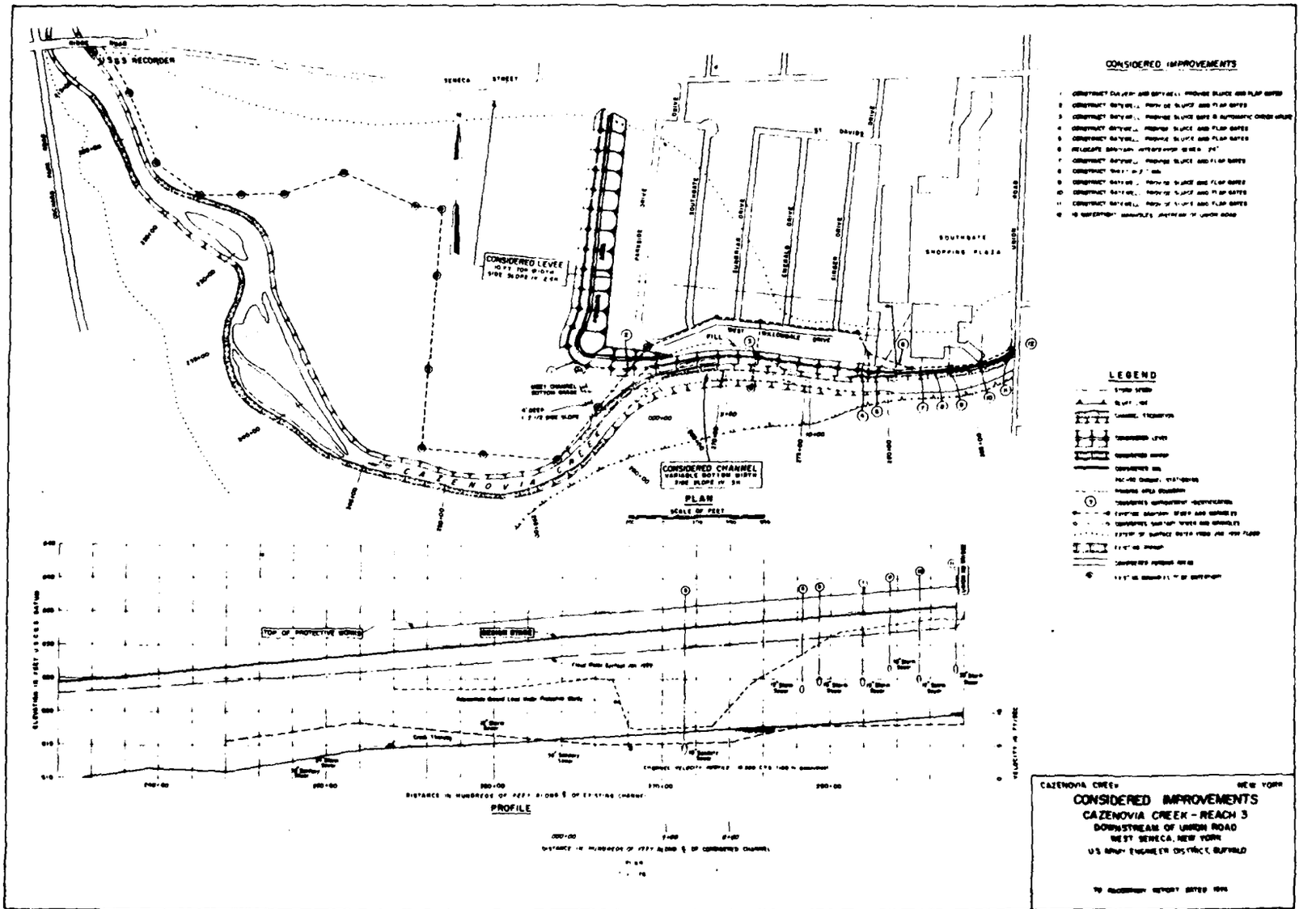

USGS RECORDER
SENECA STREET
CONSIDERED LEVEE
SOUTHGATE SHOPPING PLAZA
CONSIDERED CHANNEL
PLAN
PROFILE
CONSIDERED IMPROVEMENTS
LEGEND
CAZENOVIA CREEK
NEW YORK
CONSIDERED IMPROVEMENTS
CAZENOVIA CREEK - REACH 3
DOWNSTREAM OF UNION ROAD
WEST SENECA, NEW YORK
U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 29

SECTION 7

7. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.01 Flood management, the chief objective of the proposed project, would be attained. Flood damages would be lessened, land values would be enhanced, and the threat of loss of life and property would be lessened. A major psychological benefit to residents in the floodplain would be the feeling that flood management was accomplished. Residential units, commercial firms and essential services would be protected to varying degrees in the floodplain in West Seneca. In the long run, the proposed flood control and floodplain management measures would help reduce damage and cleanup costs to community residents, and help perpetuate the natural state of the floodway. Recreational values could increase.

7.02 Conversely, the proposed project would disrupt existing natural terrestrial and aquatic habitats along Cazenovia Creek between Mill and Leydecker Roads in West Seneca. Clearing and construction would alter the landscape. Many large trees together with associated groundcover species would be destroyed or rendered vulnerable to ice scour, and excavated soils would be displaced. Aquatic organisms and wildlife would be destroyed or driven from the area.

SECTION 8

8. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

8.01 Implementation of the proposed plan would involve the following:

a. Disruption of 15 acres of wooded scrubland, five of which would be inundated by a stilling pool, in late winter and early spring.

b. Possible destruction by siltation of approximately 1,000 feet of stream bottom habitat (immediately upstream of the dam of the ice retention structure).

c. Commitment of labor, time, money, and materials to construct the project.

d. Loss of existing natural appearance in the project area due to manmade features.

SECTION 9

9. COORDINATION

9.01 A feature of the Cazenovia Creek Study Effort has been the input of the public in the process of plan formulation. In the context of this Environmental Impact Statement, the public is defined as those with interest in the review, be they individuals, agencies, organizations, institutions, or the like. Not only has the public been encouraged to participate in plan formulation, but the Buffalo District has actively sought the informed opinion of certain groups with special interest in the project. These efforts are documented in this section.

9.02 Public Participation

9.03 A public meeting was held on 11 December 1959 to ascertain the needs and opinions of residents affected by the disastrous flood of 21 January 1959. The following items are exerpted from this meeting:

a. A member of the New York State Assembly felt that "The situation, especially in South Buffalo, is one that should be looked at carefully because the level of the creek bottom there is not much lower than the streets." He asked, "that a careful survey be made."

b. The County Supervisor, Third Ward, felt that "Immediate corrective steps should be taken so as to prevent a recurring of what happened (on 21 January 1959)."

c. The Supervisor, Town of West Seneca, presented a petition, from property owners on West Willowdale Drive, which outlined their opinion "that minimum corrective action taken should include: snagging and clearing debris, channel deepening, straightening and elimination of severe curves, contouring banks, and arranging a coordinated warning system."

d. The County Supervisor, Second Ward, presented a petition originated by the Cazenovia Creek Improvement Committee and signed by 5,300 persons within the immediate area of Cazenovia Creek, particularly in the south side of Buffalo. They requested that immediate action be taken "to prevent a repetition of the disastrous flood conditions which occurred on 21 January 1959."

e. The Mayor of East Aurora appealed "for whatever can be offered in the way of assistance to diverting the inherited water (from upstream on Tannery Brook) so that we can take care of our own (within the village limits)." The statement indicated that a Soil Conservation Service proposal and study about 1956 "recommended construction of a shallow diversionary floodway connecting that portion of the Tannery Brook basin lying east of the corporate limits with a study in 1967 and determined that a project could be justified but local interests did not favor construction.

f. The Cazenovia Creek Improvement Committee provided specific recommendations for improvement consisting of four main parts, providing for a small reservoir in Cazenovia Park and channel straightening upstream.

g. A representative property owner from the Wichita Road area indicated that they were "very much in favor of something being done to help so we will not suffer the inconvenience and loss we have had previously."

h. The United States Soil Conservation Service recommended that: the willow trees lining the channel along Legion Drive between Cazenovia Street and the mouth of Cazenovia Creek be trimmed extensively; snags and trees along the bank of Cazenovia Creek through the park be removed to reduce obstruction to flow; clearing and snagging be done between the park and Orchard Park Road; a dike be constructed around the perimeter of Cazenovia Park; and the retention of ice be increased in one or more areas between Orchard Park Road and Leydecker Road in the Town of West Seneca.

9.04 A public meeting was held by the State of New York, Department of Environmental Conservation on 29 June 1971 to obtain the view of local interests on various plans and alternatives for water resource development. Some of the structural plans and alternatives presented in the plan included multi-purpose reservoirs, upland reservoirs, and channel improvement. On 28 October 1971, the State prepared a brief report based upon the opinions expressed at the public meeting. They concluded that no significant opposition was directed to the plans presented in the report except to some of the multi-purpose reservoir proposals including the one proposed at Spring Brook.

9.05 On 28 August 1973 the Southgate Homeowners' Association of West Seneca held a meeting to discuss possible flood control alternatives. Members expressed an earnest desire to alleviate damages and a willingness to embrace any viable structural measures. In addition several informal meetings and one formal public meeting (11 December 1973) were held during the progress of this study. At each of these meetings, one of the major viewpoints expressed, particularly by the members of the Southgate Homeowners' Association, was that floodproofing by individual homeowners was considered an unacceptable alternative. Generally, it was stated that the disruption of normal services and traffic flow during high water as well as the aftermath cleanup were an undesirable aspect of the floodproofing alternative.

9.06 On 26 November 1974 a public meeting on Cazenovia Creek was held at the Allendale Junior High School to discuss the feasibility of an ice retention structure to protect areas of the Town of West Seneca and the City of Buffalo along the Creek. Comments on the recommended plan were solicited for consideration from various Federal, State and local agencies as well as individuals.

9.07 Other

9.08 In order to fully assess the environmental impacts associated with the proposed project on Cazenovia Creek, the Town of West Seneca Erie County, New York, the U. S. Department of the Interior and the New York State Office of Parks and Recreation were requested to examine the proposed project and determine impacts of project activities upon cultural resources located within or adjacent to the project locale. The Department of the Interior indicated that the project would have no adverse effect upon any existing, proposed or known potential units of the National Park System, or any known historic, natural or environmental education sites eligible for the National Landmark Programs. It was recommended that the Corps maintain contact with the State Historic Preservation Officer and the Department of Interior's Regional Office regarding archaeological matters during the course of the project work. Coordination with both of these entities will be maintained by the Corps. The New York State Parks and Recreation Department pointed out that an area just upstream of the proposed project has been considered for acquisition and development of a State park. The Department asked that the Corps also consider the probability of a continuous trail system along the banks of the creek. Such a trail system would be considered as to its feasibility during the advanced engineering and design phase of project planning. Letters requesting comments from the above mentioned agencies, as well as agency replies, are included in Appendix B, Letters of Coordination.

9.09 Federal agencies providing advice and input to the study included: U. S. Soil Conservation Service, Forest Service, U. S. Fish and Wildlife Service, Bureau of Outdoor Recreation, Environmental Protection Agency, and the U. S. Department of the Interior. State agencies with which a close liaison was maintained were: State Department of Environmental Conservation, Erie and Niagara Counties Regional Planning Board, Erie and Niagara Basin Regional Water Resources Planning Board, and the State Bureau of Fisheries. Frequent contact was also maintained with the following County and town bureaus: Erie County, City of Buffalo, Town of West Seneca, Village of East Aurora, Town of Elma and the Town of Aurora.

9.10 The Corps letter dated 26 April 1977 responded to project concerns expressed by the Erie and Niagara Counties Regional Planning Board in their letter to the Board of Engineers Rivers and Harbors dated 22 May 1975. See pages B-12 through B-15 in the "Letters of Coordination" section of this Final Environmental Statement. In addition, the District Engineer and a member of his staff met with representatives of the Erie and Niagara Counties Regional Planning Board and their Utilities Committee on 18 May 1977. At this meeting, it was reiterated by the Board that they were in favor of the ice retention project, but they also wanted additional structural measures, particularly on Tannery Brook in East Aurora. It was explained again by the District Engineer, that local protection measures for these areas were investigated, but in the final analysis, the measures were found to be economically unfeasible as independant projects. It was further explained that Corps regulations do not allow the add up of costs and benefits for measures along several separated reaches to arrive at a cost effective project. The measures for each area must be incrementally justified on their own merit. The Board and Utilities Committee still retain their position, as they still desire additional flood management measures, particularly for Tannery Brook.

9.11 The draft Environmental Statement was sent to the following agencies for review and comment:

Agency	Date of Request	Date of Comment
U. S. Department of Housing and Urban Development ATTN: Environmental Clearance Officer 26 Federal Plaza New York, NY 10007	27 Nov. 74	No Comment Received
U. S. Department of Agriculture Soil Conservation Service Midtown Plaza, Room 400 700 East Water Street Syracuse, NY 13210	27 Nov. 74	6 Jan. 75
U. S. Department of Transportation Federal Highway Administration 4 Normanskill Boulevard Delmar, NY 12054	27 Nov. 74	10 Dec. 74
U. S. Department of the Interior ATTN: Office of Environmental Project Review Washington, DC 20240	27 Nov. 74	13 Jan. 75, 16 Jan. 75 7 Mar. 75, 9 Jan. 75
Environmental Proection Agency, Region II 26 Federal Plaza, Room 847 New York, NY 10007	27 Nov. 74	27 Jan. 75
Ninth Coast Guard District 1240 East Ninth Street Cleveland, OH 44199	27 Nov. 74	No Comment Received
U. S. Department of Commerce Secretary for Environmental Affairs Washington, DC 20230	27 Nov. 74	No Comment Received
Public Health Service, Region II U. S. Department of Health, Education and Welfare Federal Building 26 Federal Plaza New York, NY 10007	27 Nov. 74	No Comment Received

Agency	Date of Request	Date of Comment
Great Lakes Basin Commission P.O. Box 999 Ann Arbor, MI 48107	27 Nov. 74	No Comment Received
New York State Office of Planning Services 488 Broadway Albany, NY 12207	27 Nov. 74	No Comment Received
New York State Office of Parks and Recreation Division of Historical Preservation Core 1 South Swan Street Building South Mall Albany, NY 12223	27 Nov. 74	No Comment Received
New York State Office of Parks and Recreation Bureau of Recreation Planning South Mall Albany, NY 12223	27 Nov. 74	No Comment Received
New York State Office of Parks and Recreation Commissioner 303 South Swan Street Building Albany, NY 12223	27 Nov. 74	10 Mar. 75
New York State Department of Commerce 99 Washington Avenue Albany, NY 12210	27 Nov. 74	No Comments Received
Office of Planning and Development New York State Department of Transportation Administrative and Engineering Building State Campus Albany, NY 12226	27 Nov. 74	No Comments Received
Program Development Division New York State Urban Development Corporation 41 State Street Albany, NY 12207	27 Nov. 74	No Comments Received

Agency	Date of Request	Date of Comment
Office of Environmental Analysis New York State Department of Environmental Conservation 50 Wolf Road Albany, NY 12205	27 Nov. 74	20 Feb. 75
Program Planning and Analysis New York State Department of Health 84 Holland Avenue - Room 250 Albany, NY 12208	27 Nov. 74	9 Dec. 74
The University of the State of New York The State Education Department Albany, NY 12224	27 Nov. 74	18 Feb. 75
New York Archaeological Council 4242 Ridge Lea Road Buffalo, NY 14226	27 Nov. 74	6 Feb. 75
Erie County Department of Planning 95 Franklin Street - 16th Floor Room 1678 Buffalo, NY 14202	27 Nov. 74	No Comment Received
Erie-Niagara Regional Counties Planning Board 2085 Baseline Road Grand Island, NY 14072	27 Nov. 74	No Comment Received
Erie County Department of Public Works Division of Highways 95 Franklin Street Buffalo, NY 14202	27 Nov. 74	No Comment Received
Erie County Department of Parks and Recreation Erie County Office Building 95 Franklin Street Buffalo, NY 14202	27 Nov. 74	No Comment Received
Erie County Environmental Management Council Erie County Office Building Room 1678 95 Franklin Street Buffalo, New York 14202	27 Nov. 74	No Comment Received

Agency	Date of Request	Date of Comment
Department of Environmental Quality of Erie County Erie County Office Building 95 Franklin Street Buffalo, NY 14202	27 Nov. 74	No Comment Received
Erie County Department of Health Edward A. Rath Building Room 910 95 Franklin Street Buffalo, New York 14202	27 Nov. 74	No Comment Received
City of Buffalo Department of Public Works Room 502 City Hall Buffalo, NY 14202	27 Nov. 74	No Comment Received
Mayor, City of Buffalo City Hall Room 201 65 Niagara Square Buffalo, NY 14202	27 Nov. 74	No Comment Received
Buffalo and Erie County Historical Society 25 Nottingham Court Buffalo, NY 14216	27 Nov. 74	No Comment Received
Erie County Water Authority 350 Ellicott Square Building Buffalo, NY 14203	27 Nov. 74	No Comment Received
Great Lakes Laboratory State University College at Buffalo Campus School, Room 332A 1300 Elmwood Avenue Buffalo, NY 14222	27 Nov. 74	No Comment Received
Environmental Clearing House Organization Buffalo Museum of Science Humboldt Parkway Buffalo, NY 14222	27 Nov. 74	No Comment Received
League of Women Voters Lake Erie Basin Committee 50 Sweetwood Drive Tonawanda, NY 14150	27 Nov. 74	No Comment Received

Agency	Date of Request	Date of Comment
National Audubon Society Central Midwest Regional Office Route 1, Box 19 Mauckport, IN 47142	27 Nov. 74	No Comment Received
Sierra Club 175 Nottingham Terrace Buffalo, NY 14216	27 Nov. 75	No Comment Received
Water Quality Task Force of Housewives to End Pollution 590 Mt. Vernon Boulevard Hamburg, NY 14075	27 Nov. 74	No Comment Received
Town of West Seneca Supervisor 1250 Union Road West Seneca, NY 14224	27 Nov. 74	No Comment Received
Town of Aurora Supervisor 5 South Grove Street East Aurora, NY 14052	27 Nov. 74	No Comment Received
Mayor of East Aurora 571 Main Street East Aurora, NY 14052	27 Nov. 74	No Comment Received
Erie County Federation of Sportsmen 221 Courtland Avenue Buffalo, NY 14215	27 Nov. 74	No Comment Received

9.09 The following agencies commented on the Revised Draft Environmental Statement:

Department of Housing and Urban Development Buffalo Area Office Grant Building 560 Main Street Buffalo, NY 14202	14 Sep. 76
U. S. Environmental Protection Agency Region II 26 Federal Plaza New York, NY 10007	1 Oct. 76

Agency	Date of Request	Date of Comment
U. S. Department of Health, Education and Welfare Office of the Secretary Washington, DC 20201		6 Oct. 76
U. S. Department of Agriculture Office of the Secretary Washington, DC 20250		29 Oct. 76
U. S. Department of the Interior Office of the Secretary Washington, DC 20240		5 Nov. 76
U. S. Department of Transportation United States Coast Guard Washington, DC 20590		11 Nov. 76
State of New York Department of Environmetnal Conservation Albany, NY 12233		13 Jan. 77

9.10 Comments received on the Draft Environmental Statement and Revised Draft Environmental Statement as well as Corps responses to these comments follow:

COMMENTS AND RESPONSES

ON THE

DRAFT ENVIRONMENTAL STATEMENT

U. S. DEPARTMENT OF TRANSPORTATION - FEDERAL HIGHWAY ADMINISTRATION
(Letter dated 10 December 1974)

COMMENT:

Due to the nature of the project, we have determined that there will be no effect on the Federal-aid system in this area. Therefore, we have no comments on the environmental impacts.

RESPONSE:

No response necessary.

COMMENT:

Since the New York Division of FHWA is assigned the responsibility of reviewing impact statements for Federal projects within New York State, please send the statements directly to:

Victor E. Taylor, Division Engineer
Federal Highway Administration
16 Russell Road
Albany, NY 12206

RESPONSE:

Future statements will be sent to the above address as requested.

U. S. DEPARTMENT OF THE INTERIOR - BUREAU OF OUTDOOR RECREATION
(Letter dated 9 January 1975)

COMMENT:

We believe that construction of a concrete ice retention dam as proposed could increase public outdoor recreation opportunity in two distinct ways. The first involves the dam itself, and the eight-foot pool expected to form behind it. We note that average pool area will be five acres, and that an additional 10 acres will be restored by grading and vegetative plantings. It appears that development of a small, day-use recreation area may be feasible, with swimming, picnicking, fishing and canoeing (possibly) being the principal uses. In addition, public access to Cazenovia Creek for these and other purposes would be increased. We recommend that the Corps of Engineers consult with local recreation and park officials concerning any interest the latter may have in establishing and operating such a recreation area, and that the final statement include information regarding the results of such consultation.

RESPONSE:

The recommended plan providing for an ice retention structure includes options for operation. Specifically, the plan provides for either maintenance of a permanent pool year-round, or maintenance of a temporary pool to serve only the intended ice retention function. During advanced engineering and design study, the Corps will coordinate with local interests in development, operation and maintenance of recreation measures.

COMMENT:

Secondly, public recreation opportunity of a somewhat different nature could, with proper planning, result from project implementation. Specifically, the dam site and recreation area discussed above could serve as a link between existing and proposed recreation facilities both downstream and upstream from it. We note, for example, the existence of Cazenovia Park downstream from the proposed dam, and also Isle View County Park - a 53 acre recreaton area located still further downstream. Also, we note in Appendix B of the draft statement that the State has considered two tracts upstream from the project area for acquisition for State park purposes. The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the importance of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of the statement.

RESPONSE:

The Erie-Niagara Counties Regional Planning Board has a Regional Recreation Plan which includes trailways along both sides of Cazenovia Creek in the vicinity of the project area. The proposed flood control project would be compatible with the Erie-Niagara Counties Regional Planning Board's plans.

U. S. DEPARTMENT OF THE INTERIOR - BUREAU OF MINES
(Letter dated 13 January 1975)

COMMENT:

Mineral resources within the watershed include carbonate rocks, natural gas, sand and gravel, shale, clays, gypsum, and possibly, salt. Our sources indicate that these mineral resources are widespread throughout Erie County and that no mineral production is being carried out within the reaches of the stream to be affected by the proposed measures. As the area to be affected by control measures will probably not exceed 35 acres along the stream, no significant impact on mineral resources is anticipated. A sentence or so to that effect should be included in the statement, otherwise we foresee no need for additional comment from the Bureau of Mines.

RESPONSE:

The environmental statement has been expanded in Section 2 under the general topic of Geological Investigation in response to the comment.

U. S. DEPARTMENT OF THE INTERIOR - NATIONAL PARK SERVICE
(Letter dated 16 January 1975)

COMMENT:

As requested by our Departmental Office of Environmental Review Coordination, we are commenting directly to you upon our review of the Draft Environmental Statement on the proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, NY. We understand from our Departmental directive that a revised Draft Environmental Statement is forthcoming on this project.

RESPONSE:

No response necessary.

COMMENT:

As indicated in Appendix B, we have followed this project closely. We would take this opportunity to acknowledge receipt of your letter of 30 December wherein you report Dr. White's archeological literature search of the project area and also that Mr. Aldrich, State Historic Preservation Officer and Dr. Funk, State Archeologist have each received copies of this Draft Environmental Statement for comment.

RESPONSE:

No response necessary.

COMMENT:

We are pleased at the Corps' cooperative endeavors of cultural resource matters in this case. We would fully expect Mr. Aldrich and Dr. White and Dr. Funk to provide all necessary information and advice for the Corps to have adequately considered and properly acted to protect cultural resources in the project area. Further, we would expect to see their comments and hope to find the discussion of the Corps' favorable reaction to them in the revised Draft and/or Final Environmental Statement.

RESPONSE:

The Corps would respond to any comments received on the Draft Environmental Statement from Mr. Aldrich, Dr. White and Dr. Funk. Responses to any such comments received would be incorporated into the revised Draft Environmental Statement.

COMMENT:

It is our feeling that inasmuch as the DES indicates the probability (p. 77) of archeological sites in the project area, that on-site

archeological surveys should be made in addition to the literature search which has been performed. Such surveys can reveal archeological materials prehistoric information not yet recorded. For further consultation on such survey, we suggest contacting Mr. Thomas King, Executive Director, New York State Archeological Council located at the Department of Anthropology, SUNY at Buffalo, 4242 Ridge Lea Road, Amherst, NY 14426.

RESPONSE:

Mr. Thomas King's letter to the District Engineer dated 6 February 1975 points out that a sample field reconnaissance and literature study to develop regional predictions of potential archaeological impact and a comparative framework for making judgments of archaeological significance would appear to be appropriate at this level of planning. Mr. King's letter is included in Appendix A entitled "Letters of Comment." Corps responses to comments from the New York Archaeological Council immediately follow this paragraph.

U. S. DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE
(Letter dated 6 January 1975)

COMMENT:

(1) Page 51, paragraph 2.71 states

". . . the chief nutrient sources are thought to come from fertilizer enriched agricultural runoff and from sewage effluent entering the creek generally upstream of West Seneca."

Although we recognize that the word "thought" is used, is it proper to think the chief source of nutrients is, among others, "fertilizer enriched agricultural runoff?"

When considering the point SANITARY DISCHARGES shown on Table 16, page 47, and some of the sharp rises of nutrients as shown on plates 13, page 53 and 14, page 54, it is not easy for the reviewer to relate nonpoint agriculturla fertilizer enriched runoff as a chief source of pollution.

RESPONSE:

The statement has been modified in paragraph 2.71 in response to the comment.

COMMENT:

(2) Page 89, paragraph 2.141

First sentence - regarding the use of the phrase "decline of agriculture" - a better wording for this sentence might be:

> "Urbanization and changing land use from agriculture to other uses is expected to continue in this basin."

RESPONSE:

Paragraph 2.141 has been expanded in the environmental statement in response to the comment.

COMMENT:

At least one meaning of "decline" is a wasting away or sinking to an inferior state which does not accurately describe agriculture in this area.

RESPONSE:

Paragraph 2.141 has been amended in the environmental statement in response to the comment.

COMMENT:

(3) Page 90, Plate 18

The legend for this master plan lumps "agricultural or vacant land." The use of "vacant land" does not seem appropriate. Presumably vacant land could include open space, land formerly cropped, wildlife land, woodland, and others.

It is not clear whether the legend applies only to the vicinity of the creek or the entire map. We find it difficult to find any farmstead symbols on this map.

RESPONSE:

Plate 18 illustrates the Erie-Niagara Counties Regional Planning Boards land use master plan. Since the plate was obtained from another agency's report, any suggested changes to its format should be directed to that agency.

COMMENT:

Page 96, paragraph 2.175

Discusses the status of improvement and riprap and vegetative work completed or being done by SCS. As worded, the paragraph is not completely accurate. A better wording for this section would be:

> "SCS was authorized, under the Flood Control Act of 1944, to assist local sponsors in applying flood control and land treatment measures in the Buffalo Creek Watershed (includes Cazenovia Creek).
>
> "The sponsoring local group, the Joint Board of Directors of the Erie and Wyoming County Soil and Water Conservation Districts, are carrying out the operation and maintenance responsibilities for the completed project. These districts are also carrying out programs of Land Treatment in the entire portion of the watershed for their respective counties.
>
> "SCS provides technical assistance, as needed, to these districts in carrying out these responsibilities."

RESPONSE:

Paragraph 2.175 has been expanded in the environmental statement in response to the comment.

COMMENT:

Page 121, paragraph 4.03 TRANSIENT IMPACT

This paragraph could be improved by stating that measures to control soil erosion during construction will be undertaken. These would include: salvage, protection and reuse of topsoil, use of temporary and prompt vegetative measure, use of mulches, and use of lime and fertilizer, as needed, to establish protective vegetation.

RESPONSE:

Paragraph 4.04 has been expanded in the environmental statement in response to the comment.

U. S. DEPARTMENT OF THE INTERIOR - FISH AND WILDLIFE SERVICE
(Letter dated 7 March 1975)

COMMENT:

The following comments are provided on the draft environmental statement for the Cazenovia Creek Flood Control proposal.

RESPONSE:

The comments have been received and responses to comments are indicated below.

COMMENT:

We understand that the subject report and a revised draft environmental statement will be subject to Departmental review at a later date.

RESPONSE:

The revised environmental statement will be coordinated with the Department of the Interior.

COMMENT:

Our comments are provided as a result of informal field review. They are submitted by the U. S. Fish and Wildlife Service as technical assistance, and are not the views of the U. S. Department of the Interior. Further review will be undertaken by this service during the Departmental review process when the Departmental position will be provided.

RESPONSE:

No response necessary.

COMMENT:

In paragraph 1.03 the proposed plan for Tannery Brook states, "No structural measure was found to be feasible, hence floodplain management is recommended". In this instance it seems that the statement should be revised to present floodplain management as the best feasible alternative. It is possible from a planning standpoint that even if a structural measure were feasible, floodplain management could be a better alternative. For all the floodplain management recommendations it would be very helpful if the discussion included information relative to why floodplain management is recommended and not required. This would be particularly useful where floodplain management is an integral part of the project and where development should be restricted even with the ice retention structure.

RESPONSE:

During a public meeting held 11 December 1959, the mayor of the Village of Aurora asked for whatever assistance could be offered to divert the inherited water (from the watershed of Tannery Brook above the village) so that we can take care of our own (water within the village limits). The villages appeal was for a structural measure of some kind to provide flood protection for existing properties. Floodplain management would not provide the desired protection for existing properties and, therefore, is not a feasible alternative to structural measures which could.

Floodplain management can be enforced only by local governments. The Federal Insurance Administration stipulates the conditions under which constituents of local governments might qualify for Federally subsidized flood insurance and Federal funding assistance; however, local governments decide whether they care to comply with such stipulations. Accordingly, the Corps can only recommend such compliance; it cannot require it.

COMMENT:

Paragraph 2.78 presents data on the aquatic plant life, but does not make reference to field investigations or studies conducted to obtain the data. Descriptions of plant or animal life should contain appropriate information and/or references to the methods used to obtain the data and other pertinent information including the time of the sampling or study, locations or areas covered, and conditions encountered.

RESPONSE:

Paragraph 2.78 has been revised indicating the source of data. The reference "1973 Erie County Stream Survey", is primarily concerned with water quality variables and simply lists commonly observed, identified, aquatic plants as accessory information. No filed data is presented with the plant lists in this publication.

COMMENT:

In paragraph 2.84 the source of the surveys conducted in 1958 and 1967 should be identified. Table 21 should contain the appropriate reference.

RESPONSE:

Paragraph 2.84 has been revised accordingly indicating the source of the surveys. Note that the original survey was conducted in 1956 not 1958. Table 21 has been revised accordingly.

COMMENT:

Paragraph 2.87 discusses vegetation in the Cazenovia Creek area, stating, "A comprehensive listing of vegetation found in Cazenovia Basin is given in Table 22". Table 22 does not present a comprehensive list of the

vegtation in the Cazenovia Creek Basin. A survey of the vegetation in the project area would be more relevant. This is important because the list in Table 22 includes Euonymus obovatus Nutt., Running Strawberry Bush, which is a protected native plant in New York State pursuant to the New York State Environmental Conservation Law, Section 9-1503. The project area should be surveyed to see if this protected species is, in fact, present.

RESPONSE:

At the present time a vegetation survey in the project area is not possible. A short-term survey of vegetation in the project area will be performed by a Corps Ecologist during the summer of 1975. If funds are appropriated for future, more comprehensive field surveys, the possibility of a botanic study would be considered.

COMMENT:

Paragraphs 2.91 - 2.106 discuss wildlife and endangered species. Project specific surveys and listings and then determinations as to the status of the species present should be presented in the statement.

RESPONSE:

Presently funds are not available to conduct wildlife field surveys in the project area. The listings and discussions given in these sections are for information purposes. Listed are all wildlife and endangered species ever observed in the general project area. Admittedly, the status of these species cannot be determined from the data presented.

COMMENT:

Section 2.148 describes the environment in the vicinity of the proposed ice retention structure. Consideration of this area should include the results of the vegetation survey in the proposed structure and pool area.

RESPONSE:

The suggested consideration of vegetation in the area of the proposed ice retention structure will be given if funds are appropriated for further project field investigations.

COMMENT:

Section 4 regarding the impacts of the proposal may need to be revised after the vegetation in the ice retention structure area has been investigated. The same may hold true for Section 5.

RESPONSE:

It is acknowledged that collection of original field data on vegetation in the project area would probably require revision of the above mentioned Sections.

U. S. ENVIRONMENTAL PROTECTION AGENCY - REGION II
(Letter dated 27 January 1975)

COMMENT:

EPA is in agreement with the Corps' use of nonstructural measures to help control flooding hazards. Nonstructural measures can reduce the potential economic impacts of flooding while at the same time they allow the floodplain to continue its natural functions.

RESPONSE:

No response necessary.

COMMENT:

The EIS mentions that the turbidity and sedimentation resulting from construction and maintenance programs could destroy spawning beds and smoother benthic organisms. The final EIS should discuss the type and extensiveness of the spawning beds which are located in the project area.

RESPONSE:

The revised environmental statement has been expanded in response to the comment. Additional information on the fishery in Cazenovia Creek, Town of West Seneca, was requested by the Corps from the New York State Department of Conservation, Region 9 Division of Fish and Wildlife. Information received from that agency has been inserted into Appendix B entitled, "Letters of Coordination" and includes results of electrofishing sampling and also spawning data on Cazenovia Creek.

COMMENT:

Ice-breaking methods have been used fairly successfully in the past to prevent ice jams which produce flooding hazards. Will the dam remove this necessity or will ice breaking still be required in certain areas, such as below the Cazenovia Street Bridge? In other words will ice-jamming floods still be possible below the dam? If so, then how often will they occur and how do they affect the need for the dam?

RESPONSE:

Although ice-affected floods would be possible downstream from the considered ice retention structure, the probability of such floods would be reduced greatly by the structure. With the ice retention structure functioning only that ice formed in the lower 6.4 mile reach of the creek (from the site of the dam of the structure to the mouth of the creek)

would contribute to jamming. The probability and extent of jamming in the lower portion are functions of ice production on the full 6.4 mile reach - and such ice production is small in light of the creek's ability to conduct it - the probability of ice jamming in the downstream portion would be small. Furthermore, in light of past and intended effort by the City of Buffalo to straighten and greatly reduce the roughness of the lower 1.2 mile portion of this 6.4 mile reach, the opportunity for ice jamming has been greatly reduced and will be further reduced.

COMMENT:

While summer daytime water quality data are included in the EIS, there are no seasonal or diurnal water quality data. Since this information is required to determine if anoxic conditions could occur in the permanent pool, this information should be included in the final EIS.

RESPONSE:

Because of the general physical configuration of the pool (i.e. - the existing stream channel), flow would continuously occur throughout the entire width and length of the pool. While the stilling pool is forming, outflow would occur through the only partially closed drain conduits. Although this outflow would be somewhat less than inflow, it would be continuous. Once the stilling pool forms, fluctuating stream flow common at the time of year that the ice retention structure is needed would tend to help purge the pool area. With reference to the above comment, although the Corps recognizes that additional water quality data may be of value to determine anoxic conditions in a permanent pool, the stilling pool area used to form the ice retention structure would not be a permanent pool. Also, continuous outflow of stream water is expected to occur during the time of stilling pool formation; therefore, anoxic conditions are not anticipated to occur in the proposed project area.

COMMENT:

Thank you for the opportunity to review this EIS. Three copies of the final EIS are requested for subsequent review.

RESPONSE:

Upon completion of the final EIS, three copies will be mailed to the U. S. EPA - Region II office as requested.

NEW YORK STATE PARKS AND RECREATION DEPARTMENT
(Letter dated 10 March 1975)

COMMENT:

The Division for Historic Preservation, functioning in its capacity as the staff of the State Historic Preservation Officer, has reviewed both the archeological literature survey and the Draft Environmental Statement concerning Cazenovia Creek.

RESPONSE:

No response necessary.

COMMENT:

Please note that the Draft Environmental Statement contains one discrepancy. In the summary statement, it is mentioned that the Federal Register was consulted for National Register listings and that none exist in the vicinity of the proposed project work. Page 77 (sec. 2.121) mentions the Millard Fillmore birthplace. The birthplace of Millard Fillmore was recently named a National Historic Landmark, and is therefore listed on the National Register of Historic Places.

RESPONSE:

The summary and paragraph 2.121 have been revised accordingly.

COMMENT:

The literature survey and the DEIS as it reflects that search appear to be adequate as evidence of a preliminary investigation. However, on the basis of Dr. White's research, we recommend that further archeological work be done. On-site archeological surveys should be made in the project locations where the land will not be disturbed in any way.

RESPONSE:

At the present time, consideration is being given by the Corps for appropriating funds for a comprehensive archeological survey of the Cazenovia Creek project area. The services of a professional archeologist will be contracted for this survey.

STATE OF NEW YORK DEPARTMENT OF HEALTH - REGIONAL OFFICE
(Letter dated 9 December 1974)

COMMENT:

The area involved has suffered considerably in past years from flood damage and the proposed project would provide much needed relief.

RESPONSE:

No response necessary.

COMMENT:

Cazenovia Creek is not utilized as a source for municipal water supply. Residents along the upper reaches of Cazenovia Creek derive their water supply from individual wells and springs. In either case, the proposed project will have no adverse affect on the quality and quantity of drinking water to the communities and residents involved.

RESPONSE:

No response necessary.

COMMENT:

The plan provides added protection to the public through land use controls by flood plain zoning and subdivision regulations. Through proper municipal planning and zoning, additional recreational benefits can also be derived.

RESPONSE:

No response necessary.

COMMENT:

This office supports the project as it fulfills an immediate and serious need.

RESPONSE:

No response necessary.

COMMENT:

I recommend that the Erie County Health Department be given an opportunity to review and comment on the study.

RESPONSE:

The Erie County Health Department has been sent a copy of the Draft Environmental Statement in November 1974 for review and comment.

NEW YORK ARCHAEOLOGICAL COUNCIL
(Letter dated 6 February 1975)

COMMENT:

I have recently received a copy of your Draft Environmental Statement on the Feasibility Study of Cazenovia Creek, and also a copy of the comments provided you on 16 January by the Department of the Interior requesting on-site archaeological surveys during preparation of the Final Environmental Statement.

RESPONSE:

No response necessary.

COMMENT:

I assume from my perusal of the Draft that you are engaged in a General Investigation on Cazenovia Creek and are not yet approaching preparation of a General Design Memorandum.

RESPONSE:

The Corps is presently engaged in a General Investigation on Cazenovia Creek. Further study to implement the recommended plan would be accomplished, provided the project is authorized for construction by the Congress.

COMMENT:

A sample field reconnaissance and literature study to develop regional predictions of potential archaeological impact and a comparative framework for making judgments of archaeological significance would appear to be appropriate at this level.

RESPONSE:

No response necessary.

COMMENT:

We would be happy to prepare a proposal for such a study, or for any more intensive work you think necessary to your planning. Please feel free to contact me about this or other projects at the address and phone number given below.

RESPONSE:

The services of a qualified professional archaeologist will be considered to make the archaeological field survey for the proposed project. Federal procurement regulations would be followed in obtaining such services.

THE STATE EDUCATION DEPARTMENT, ALBANY, NY - NYS MUSEUM & SCIENCE SERVICE
(Letter dated 18 February 1975)

COMMENT:

We have reviewed the Draft Environmental Impact Statement for the Cazenovia Creek flood control project and the report on cultural resources prepared by Dr. White, S.U.N.Y. Buffalo.

RESPONSE:

No response necessary.

COMMENT:

Given the characteristics of both the area and of the project itself, we recommend that an archeological survey be carried out prior to construction, conducted by professional archeologists experienced in such work.

RESPONSE:

The Buffalo District is currently in the process of developing a program to determine presence of cultural resources in the District's proposed project areas. The proposed Cazenovia Creek project area will be investigated to determine if any significant archaeological resources exist.

COMMENT:

We suggest that you negotiate directly with Dr. White for the completion of such a survey, and that you keep us apprised of the progress of this procedure.

RESPONSE:

The services of a qualified professional archaeologist would be considered to make the archaeological field survey for the proposed project. Federal procurement regulations would be followed in obtaining such services. When the survey is done, the Buffalo District office will keep you appraised of its progress as requested.

COMMENT:

We will be glad to review further any aspects of this process as you may desire, and feel free to contact us at any time.

RESPONSE:

Your consideration and interest in cultural resource evaluation on the proposed project is appreciated. The Corps District Office will continue to coordinate with the State Archaeologist on its projects in New York State.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(Letter dated 20 February 1975)

COMMENT:

Erosion control measures and vegetative plantings should be installed on disturbed areas immediately upon completion of construction in order to minimize siltation in the stream. Temporary erosion control measures should be used if disturbed areas are to be left unprotected for any considerable length of time.

RESPONSE:

Removal of vegetation would temporarily expose soils along Cazenovia Creek to climatic elements such as wind and rain, until new ground cover plantings and natural plant invasions are reestablished on the project site. However, exposure of soil would be temporary because disturbed soils along the streambank would be promptly planted to vegetation. This would be done by preparation of a seedbed, fertilization and mulching with hay or straw. Use of some trees and shrubs would also be considered. Vegetation selected for planting would be based on species adaptable to soils and climatic conditions for the general locale, in order to help mitigate adverse environmental effects on the aesthetic appearance and wildlife cover in the project area. Advice as to most suitable vegetative plantings for use on soil types in the project area would be coordinated with the local soil conservation service office.

Also, negative environmental impacts of the proposed structural flood control measure would be mitigated during construction to some extent in that, the Contractor would be required to abide by contract specifications which includes a section on protection of the environment. General requirements are outlined in the "Civil Works Construction Guide Specifications for Environment Protection (CE 1300, June 1973)." The Contractor would be required to have water-tight equipment, including coamings, which must be maintained in order to prevent spillage of oils and excavated materials. In addition, the Contractor would be required to prevent or control siltation, air pollution, erosion, spillage (including accidental), disposal, turbidity and maintenance of any pollution control facilities deemed necessary for the duration of the project. Other environmental protection measures to reduce potential erosion and to mitigate aesthetic impact would also be implemented during and after costruction. This would include protection of disturbed soil by mulching and vegetative plantings.

COMMENT:

Consideration should be given to planting vegetation to compensate for lost wildlife habitat. Planting wildlife shrubs and conifers in open areas adjacent to the dam and a shrub corridor around the north end of the dam would have a mitigating effect on wildlife.

RESPONSE:

Planting of vegetation to compensate for lost wildlife habitat, such as planting of appropriate wildlife shrubs and conifers, will be given consideration as recommended in the above comment. The New York State Department of Environmental Conservation and U. S. Soil Conservation Service would also be consulted in selection of vegetation species best adaptable to growing conditions in the general project locale.

COMMENT:

Provisions should be made to minimize land clearing and construction activities during the period that bird and mammal reproductive nesting occurs. This activity normally occurs between 1 May and 30 June.

RESPONSE:

Plans and specifications for construction of the proposed project would contain provisions to help mitigate disturbance of bird and mammal nesting habitat during the May - June nesting period. Such provisions would include minimization of land clearing and construction activities where possible.

COMMENT:

The statement indicates that the ice retention pool will be periodically drained for sediment removal. However, sedimentation rates, which will affect the frequency of sediment removal, and disposal sites for the removed sediment should be discussed. The USDA Soil Conservation Service has recently completed an Erosion and Sediment Inventory (E.A.S.I.) for New York and should be consulted for determining the sediment load that can be expected at the ice retention structure.

RESPONSE:

The stilling pool of the ice retention structure would exist only shortly before and during periods (late winter and early spring of each year) that ice floes are likely. During any other period, the stilling pool would have little effect on flood management and, therefore, could be drained. Even though local parties may choose to maintain a permanent pool, little sedimentation would be likely. Objectives pursued in design of sediment basins include providing a long shallow stilling pool (to permit settlement of small particles which settle slowly), and reducing flow velocities and maintaining them as constant as possible (to reduce turbulence which inhibits sedimentation). The proposed ice retention structure provides for only the first parts of the two objectives - its stilling pool is long and would tend to reduce flow velocities.

Because the magnitudes of flow fluctuate widely during the period that ice floes are likely, most material that might settle is expected to be scoured later and borne downstream. In view of this, the benefit of possible sedimentation in the pool was not included in the economic evaluation analyses for the proposed project.

Since the rate of scour from the site is expected to nearly equal the rate of sedimentation at the site, the suspended material load of the creek at the site is of minor import.

COMMENT:

The statement recognizes that the pool may be subject to stagnation. It appears from the nature of the stream that the stagnation may be a yearly problem during the summer months. A discussion of the procedures and the agency responsible for monitoring conditions in the pool that favor stagnation should be presented. If the pool is not continually monitored, consideration should be given to draining the pool every year prior to the summer season.

RESPONSE:

As indicated in the previous comment, the stilling pool of the ice retention structure is necessary only shortly before and during periods that ice floes are likely. During these periods (late winter and early spring), stagnation of the pool is unlikely. Should local parties choose to maintain a permanent pool, they could arrange with the New York State Department of Environmental Conservation regarding testing of the pool's water to determine its suitability for any intended uses as well as monitoring of pool conditions.

COMMENT:

The statement should indicate whether construction activities or operation of the project will periodically interrupt stream flow. Measures should be taken to insure that a sufficient flow of water to sustain aquatic life downstream is maintained at all times.

RESPONSE:

The flow of Cazenovia Creek need not be interrupted during construction or operation of the ice retention structure. Although the creek channel at the dam site must be dewatered to enable construction, the creek would be temporarily diverted beforehand to flow continuously during such dewatering and construction. In order to form the stilling pool, the gates of the dam would have to be closed only partially. Accordingly, continuous outflow from the stilling pool would be available to sustain aquatic life of the creek downstream from the site of the ice retention structure.

COMMENT:

Thank you for the opportunity to review this statement. We would like two copies of the Final E.I.S. when it is available.

RESPONSE:

Upon completion of the Final Environmental Statement for the feasibility study of Cazenovia Creek, two copies of the Final Environmental Statement will be sent to your office as requested.

AD-A101 705 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 13/2
BUFFALO METROPOLITAN AREA, NEW YORK WATER RESOURCES MANAGEMENT.--ETC(U)
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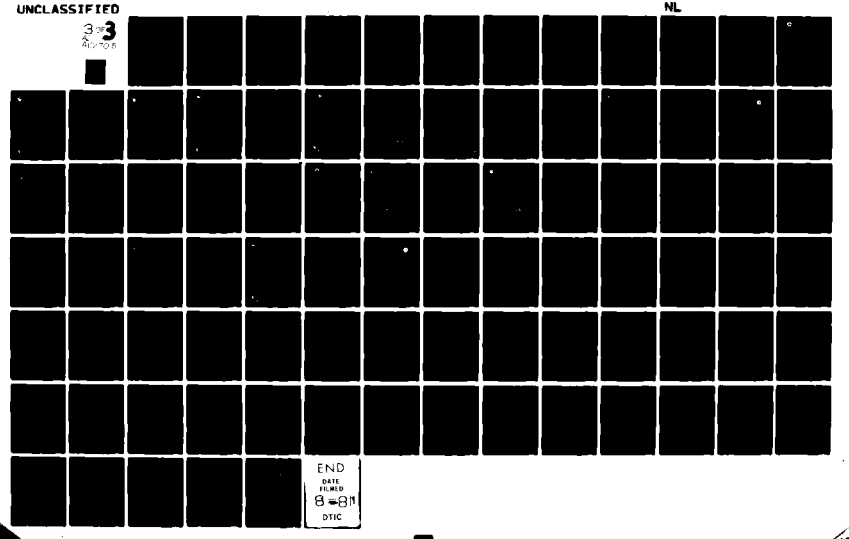

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COMMENTS AND RESPONSES

ON THE

REVISED DRAFT ENVIRONMENTAL STATEMENT

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
(Letter dated 14 September 1976)

COMMENT:

A review of the Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed indicates that this project is consistent with HUD objectives and should make residential development more attractive in the Cazenova Creek Watershed Area.

RESPONSE:

No response necessary.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
(Letter dated 1 October 1976)

COMMENT:

We have reviewed the Addendum to the Cazenovia Creek Revised Draft Environmental Impact Statement (EIS) concerning archaeological resources and are somewhat confused as to how an addendum to a revised draft EIS can be issued before the revised draft EIS.

RESPONSE:

During review of the Revised Draft Environmental Statement by Corps higher authority, it was determined that a cultural reconnaissance study of the project area was necessary. Therefore, to fulfill the request of higher authority, a literature search and field investigation was conducted, which resulted in preparation of an Archaeological Resource Addendum to be added to the Cazenova Creek Revised Draft Environmental Statement. After review of the Addendum by Corps higher authority, a copy of the Addendum was then forwarded to other agency reviewers.

COMMENT:

Nevertheless, our review of the addendum and an unofficial copy of the revised draft EIS obtained from the Buffalo District Office, indicates that the proposed project should not produce significant adverse environmental impacts.

RESPONSE:

No response necessary.

COMMENT:

In accordance with EPA procedures, we have rated the revised draft EIS and the addendum as LO-1, indicating that we lack objection to the project as proposed (LO) and that the environmental impacts of the project are adequately set forth in the documents (1).

RESPONSE:

No response necessary.

COMMENT:

If you have any questions concerning this letter, please feel free to contact our office at 8-264-8556. A copy of the final EIS is requested for subsequent review.

RESPONSE:

Upon completion of the FEIS on Cazenovia Creek, a copy of the statement will be forwarded to the USEPA office for review as requested.

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
(Letter dated 6 October 1976)

COMMENT:

The Department's New York Regional Office has reviewed the draft environmental impact statement concerning the Cazenovia Creek Watershed, New York. On the basis of this review, we feel that impacts in those areas of concern to this Department have been adequately addressed.

RESPONSE:

No response necessary.

U. S. DEPARTMENT OF AGRICULTURE
(Letter dated 29 October 1976)

COMMENT:

The proposed works involve the ponding of floodwaters to reduce the incidence of ice jamming. However, the area affected by ponding floodwaters is not discussed with the precision that characterizes much of the report. On page 72 (Main Report) we note reference to impacts on "approximately 20 acres of agricultural land and 75 acres of undeveloped scrubland." Presumably, some current farm uses of land will be displaced by the project. A further description of the farmland, the intensity of its use, identification of prime farmland soils, and impacts on these by the project would be appropriate and should also be included in the environmental impact statement.

RESPONSE:

Roughly 45 acres of the 95-acre tract mentioned in the comment letter dated 29 October 1976 contain prime farmland soils. This acreage, located along the north side of Cazenovia Creek (See Soil Survey Map - Plate 11), includes about 9 acres of Hamlin silt loam and 36 acres of Teel silt loam.* Presently, about 9 acres of this prime soil acreage is cropland, 12 acres is grassland (hayland and private yards), and approximately 24 acres is made up of brushland, small evergreen plantings and hardwood tree cover. The remaining 50 acres of the 95-acre tract is idle land, overgrown with weeds and interspersed with shrubs and trees that have invaded the floodplain and adjacent valley banks. The function of the project would be to retain ice to reduce the incidence of ice jamming downstream in Cazenovia Creek - not to pond floodwaters. Presently, the 45 acres of prime farmland soil is subject to seasonal flooding. With the project, flooding of this land would be insignificantly different in areal extent and depth than under existing conditions. Therefore, flooding impact of the project on these floodplain lands would be minimal. Some prime farmland soil would be lost of excavation for the stilling pool immediately upstream from the dam. Approximately 5 acres of Teel silt loam would be removed from potential future use as farmland. Land presently used for crops in the project area is located upstream from the stilling pool excavation zone. This land is within the 100-year floodplain with or without a project.

*Coordination with the U. S. Soil Conservation Service Office in East Aurora, New York on 1 March 1977

U. S. DEPARTMENT OF THE INTERIOR
(Letter dated 5 November 1976)

COMMENT:

Thank you for the letter of 11 August 1976, requesting our views and comments on the draft environmental statement and interim report for Flood Management in Cazenovia Creek Watershed, Erie County, New York. We have reviewed the documents and conclude that they adequately considered those areas within our jurisdiction and expertise. We are especially pleased with the consideration the Corps of Engineers has given to most of our previous comments. However, we wish to reiterate the concern expressed in our letter of 9 January 1975, that "The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the important of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of that statement."

RESPONSE:

The Erie and Niagara Counties Regional Planning Board reviewed the Buffalo Metropolitan Area Interim Report on Flood Management for the Cazenovia Creek Watershed, and transmitted their findings in the form of a statement for Corps consideration. Proposals presented during a public hearing on 21 June 1974 concerning the Feasibility Study of the Cazenovia Creek Interim Report for Flood Control were evaluated and compared to Regional Planning Board Programs - one of these programs was the "Adopted Recreation and Open Space Plan." A copy of the Erie and Niagara Counties Regional Planning Board's transmittal letter dated 22 May 1975 (Page B-12) with the statement (Page B-13) has been included in Appendix B, Letters of Coordination, of this Final Environmental Statement.

COMMENT:

We do not believe the response to this comment, which is included in the subject document, fully addresses our concern. The final statement should include copies of relevant communications with the Erie-Niagara Counties Regional Planning Board attesting to the compatibility of the project with their Regional Recreation Plan. In the event that post-authorization studies indicate that the project site would serve as an important link in a streamside trail system, the project should be designed to incorporate suitable rights-of-way, gradients and such other allowances as are necessary for trail construction. In this way, the project will not merely be compatible with existing plans, but will provide an existing base for the implementation of these plans.

RESPONSE:

The project lands acquired for construction and subsequent maintenance of the proposed ice retention structure on Cazenovia Creek could serve as a terminus for a bike path-nature trail that would interconnect existing public-use facilities. The trailway as proposed by the Corps of Engineers in their Interim Report dated December 1975, would not only provide a trail in the project lands acquired upstream at the proposed dam, but would interconnect Mill Park - a relatively small park in the town of West Seneca - with a large multi-purpose park in the city of Buffalo. This trailway - except for a very small portion along Union Road - would be located mostly along Cazenovia Creek. The proposed trail was discussed and coordinated with the Northeast Regional Office of the Bureau of Outdoor Recreation, who indicated the plan would meet eligibility criteria for matching funds from the land and Water Conservation Fund. The bike and nature trail plan was also fully accepted at a public meeting held on 5 November 1975 conducted to discuss water-related recreational opportunities in the Buffalo Metropolitan Area. The Erie and Niagara Counties Regional Planning Board has been invited to all of the Corps of Engineers meetings regarding the Cazenovia Creek Project and other water-related recreation meetings. A copy of their response to the proposed ice retention structure is included in Appendix B (Pages B-12 and B-13). Their response was not adverse to the bike path or nature trail. Furthermore, the bike path and nature trail would be compatible to the Regional Recreation and Open Space Plan and Program adopted 11 November 1971 and amended 13 April 1972. Any construction of a bike path and nature trail would be fully coordinated with the New York State Office of Parks and Recreation, who would review the plan to determine its compatibility with their Statewide Comprehensive Outdoor Recreation Plan. Their review would include site suitability, rights-of-way, gradient, funding, priorities and other necessary matters related to trail construction.

DEPARTMENT OF TRANSPORTATION - U. S. COAST GUARD
(Letter dated 11 November 1976)

COMMENT:

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

RESPONSE:

No response necessary.

NEW YORK STATE DEPARTMENT OF ENVIROMENTAL CONSERVATION
(Letter dated 13 January 1977)

COMMENT:

This is in reply to your letter of 16 December 1976, and the earlier letter of 9 August 1976, from General Morris regarding the proposed report of the Chief of Engineers on Cazenovia Creek Watershed, New York. Department staff have worked closely with Buffalo District during development of the feasibility report and EIS and have provided detailed comments upon the draft reports.

RESPONSE:

No response necessary.

COMMENT:

The proposed final report reflects the comments provided to the District and this Department has no further comments to offer on behalf of New York State. The State strongly supports the authorization by Congress of the plan proposed by the Chief of Engineers.

RESPONSE:

No response necessary.

APPENDIX A

LETTERS OF COMMENT

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
16 Russell Road
Albany, New York 12206

December 10, 1974
IN REPLY REFER TO:

01-36.2

Byron G. Walker, Major, C. E.
Deputy District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

We have reviewed the draft environmental impact statement on the proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, New York. The statement was transmitted with your letter of 27 November 1974 to our Regional office.

Due to the nature of the project, we have determined that there will be no effect on the Federal-aid system in this area. Therefore, we have no comments on the environmental impacts.

Since the New York Division of FHWA is assigned the responsibility of reviewing impact statements for Federal projects within New York State, please send the statements directly to:

Victor E. Taylor, Division Engineer
Federal Highway Administration
16 Russell Road
Albany, New York 12206

Sincerely yours,

Victor E. Taylor
Division Engineer

United States Department of the Interior

BUREAU OF OUTDOOR RECREATION
NORTHEAST REGIONAL OFFICE
Federal Building - Room 9310
600 ARCH STREET
Philadelphia, Pennsylvania 19106

IN REPLY REFER TO:
ER 74/1466

JAN 6 1975

Major Byron G. Walker
Deputy District Engineer
U. S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

In response to your request of November 27, 1974, we have reviewed the draft environmental statement prepared for the proposed flood control project on Cazenovia Creek, Erie County, New York.

We believe that construction of a concrete ice retention dam as proposed could increase public outdoor recreation opportunity in two distinct ways. The first involves the dam itself, and the 8-foot pool expected to form behind it. We note that average pool area will be 5 acres, and that an additional 10 acres will be restored by grading and vegetative plantings. It appears that development of a small, day-use recreation area may be feasible, with swimming, picnicking, fishing and canoeing (possibly) being the principal uses. In addition, public access to Cazenovia Creek for these and other purposes would be increased. We recommend that the Corps of Engineers consult with local recreation and park officials concerning any interest the latter may have in establishing and operating such a recreation area, and that the final statement include information regarding the results of such consultation.

Secondly, public recreation opportunity of a somewhat different nature could, with proper planning, result from project implementation. Specifically, the dam site and recreation area discussed above could serve as a link between existing and proposed recreation facilities both downstream

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and upstream from it. We note, for example, the existence of Cazenovia Park downstream from the proposed dam, and also Isle View County Park - a 53 acre recreation area located still further downstream. Also, we note in APPENDIX B of the draft statement that the State has considered two tracts upstream from the project area for acquisition for state park purposes. The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the importance of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of the statement.

We appreciate the opportunity to comment upon this draft statement.

Sincerely,

DEPUTY Regional Director

United States Department of the Interior

BUREAU OF MINES

4800 FORBES AVENUE
PITTSBURGH, PENNSYLVANIA 15213

ER 74/1466 January 13, 1975

Major Byron G. Walker
Deputy District Engineer
U. S. Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

Re: Draft Environmental Statement on proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, New York

We have reviewed the draft environmental statement and offer the following comments:

Mineral resources within the watershed include carbonate rocks, natural gas, sand and gravel, shale, clays, gypsum, and possibly, salt. Our sources indicate that these mineral resources are widespread throughout Erie County and that no mineral production is being carried out within the reaches of the stream to be affected by the proposed measures. As the area to be affected by control measures will probably not exceed 35 acres along the stream, no significant impact on mineral resources is anticipated. A sentence or so to that effect should be included in the statement, otherwise we foresee no need for additional comment from the Bureau of Mines.

Sincerely yours,

Robert D. Thomson

Robert D. Thomson, Chief
Eastern Field Operation Center

cc: R. S. Babb, Boston, Mass.
B. Blanchard, Washington, D.C.

United States Department of the Interior

NATIONAL PARK SERVICE
NORTH ATLANTIC REGION
150 CAUSEWAY STREET
BOSTON, MA. 02114

IN REPLY REFER TO:
L-7619-NAR-(CE)
ER-74/1466

JAN 16 1975

District Engineer
Buffalo District
U. S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Sir:

As requested by our Departmental Office of Environmental Review Coordination, we are commenting directly to you upon our review of the Draft Environmental Statement on the proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, New York. We understand from our Departmental directive that a revised Draft Environmental Statement is forthcoming on this project.

As indicated in Appendix B, we have followed this project closely. We would take this opportunity to acknowledge receipt of your letter of 30 December wherein you report Dr. White's archeological literature search of the project area and also that Mr. Aldrich, State Historic Preservation Officer and Dr. Funk, State Archeologist have each received copies of this Draft Environmental Statement for comment.

We are pleased at the Corps' cooperative endeavors of cultural resource matters in this case. We would fully expect Mr. Aldrich and Dr. White and Dr. Funk to provide all necessary information and advice for the Corps to have adequately considered and properly acted to protect cultural resources in the project area. Further, we would expect to see their comments and hope to find the discussion of the Corps' favorable reaction to them in the revised Draft and/or Final Environmental Statement.

It is our feeling that inasmuch as the DES indicates the probability (p. 77) of archeological sites in the project area, that on-site

archeological surveys should be made in addition to the literature search which has been performed. Such surveys can reveal archeological materials prehistoric information not yet recorded. For further consultation on such survey, we suggest contacting Mr. Thomas King, Executive Director, New York State Archeological Council located at the Department of Anthropology, SUNY at Buffalo, 4242 Ridge Lea Road, Amherst, New York 14426.

Sincerely yours,

John D. Rogers.

Regional Director

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
100 Grange Place
Cortland, NY 13045

March 7, 1975

Col. Bernard C. Hughes,
District Engineer
U.S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

The following comments are provided on the draft environmental statement for the Cazenovia Creek Flood Control proposal. We understand that the subject report and a revised draft environmental statement will be subject to Departmental review at a later date. Our comments are provided as a result of informal field review. They are submitted by the U.S. Fish and Wildlife Service as technical assistance, and are not the views of the U.S. Department of the Interior. Further review will be undertaken by this Service during the Departmental review process when the Departmental position will be provided.

In paragraph 1.03 the proposed plan for Tannery Brook states, "No structural measure was found to be feasible, hence floodplain management is recommended". In this instance it seems that the statement should be revised to present floodplain management as the best feasible alternative. It is possible from a planning standpoint that even if a structural measure were feasible, floodplain management could be a better alternative. For all the floodplain management recommendations it would be helpful if the discussion included information relative to why flood plain management is recommended and not required. This would be particularly useful where floodplain management is an integral part of the project and where development should be restricted even with the ice retention structure.

Paragraph 2.78 presents data on the aquatic plant life, but does not make reference to field investigations or studies conducted to obtain the data. Descriptions of plant or animal life should contain appropriate information and/or

references to the methods used to obtain the data and other pertinent information including the time of the sampling or study, locations or areas covered, and conditions encountered.

In paragraph 2.84 the source of the surveys conducted in 1958 and 1967 should be identified. Table 21 should contain the appropriate reference.

Paragraph 2.87 discusses vegetation in the Cazenovia Creek area, stating, "A comprehensive listing of vegetation found in Cazenovia Basin is given in Table 22". Table 22 does not present a comprehensive list of the vegetation in the Cazenovia Creek Basin. A survey of the vegetation in the project area would be more relevant. This is important because the list in Table 22 includes Euonymus obovatus Nutt., Running Strawberry Bush, which is a protected native plant in New York State pursuant to the New York State Environmental Conservation Law, Section 9-1503. The project area should be surveyed to see if this protected species is, in fact, present.

Paragraphs 2.91 - 2.106 discuss wildlife and endangered species. Project specific surveys and listings and then determinations as to the status of the species present should be presented in the statement.

Section 2.148 describes the environment in the vicinity of the proposed ice retention structure. Consideration of this area should include the results of the vegetation survey in the proposed structure and pool area.

Section 4 regarding the impacts of the proposal may need to be revised after the vegetation in the ice retention structure area has been investigated. The same may hold true for Section 5.

We appreciate the opportunity to comment at this time.

Yours sincerely,

Willard W. Cole, Jr.
Area Office Supervisor

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
700 East Water Street, Syracuse, New York 13210

January 6, 1975

Major Byron G. Walker
Deputy District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

We have reviewed the Draft Environmental Statement on the proposed Phase II Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Erie County, New York, dated November 1974.

Our comments follow:

(1) Page 51, paragraph 2.71 states

"..... the chief nutrient sources are thought to come from fertilizer enriched agricultural runoff and from sewage effluent entering the creek generally upstream of West Seneca."

Although we recognize that the word "thought" is used, is it proper to think the chief source of nutrients is, among others, "fertilizer enriched agricultural runoff?"

When considering the point SANITARY DISCHARGES shown on Table 16, page 47, and some of the sharp rises of nutrients as shown on plates 13, page 53 and 14, page 54, it is not easy for the reviewer to relate nonpoint agricultural fertilizer enriched runoff as a chief source of pollution.

(2) Page 89, paragraph 2.141

First sentence - regarding the use of the phrase "decline of agriculture" - a better wording for this sentence might be:

> "Urbanization and changing land use from agriculture to other uses is expected to continue in this basin."

At least one meaning of "decline" is a wasting away or sinking to an inferior state which does not accurately describe agriculture in this area.

(3) Page 90, Plate 18

The legend for this master plan lumps "agricultural or vacant land." The use of "vacant land" does not seem appropriate. Presumably vacant land could include open space, land formerly cropped, wildlife land, woodland, and others.

It is not clear whether the legend applies only to the vicinity of the creek or the entire map. We find it difficult to find any farmstead symbols on this map.

(4) Page 96, paragraph 2.175

Discusses the status of improvement and riprap and vegetative work completed or being done by SCS. As worded, the paragraph is not completely accurate. A better wording for this section would be:

"SCS was authorized, under the Flood Control Act of 1944, to assist local sponsors in applying flood control and land treatment measures in the Buffalo Creek Watershed (includes Cazenovia Creek).

"The sponsoring local group, the Joint Board of Directors of the Erie and Wyoming County Soil and Water Conservation Districts, are carrying out the operation and maintenance responsibilities for the completed project. These districts are also carrying out programs of Land Treatment in the entire portion of the watershed for their respective counties.

"SCS provides technical assistance, as needed, to these districts in carrying out these responsibilities."

(5) Page 121, paragraph 4.03 TRANSIENT IMPACT

This paragraph could be improved by stating that measures to control soil erosion during construction will be undertaken. These

would include: salvage, protection and reuse of topsoil, use of temporary and prompt vegetative measure, use of mulches, and use of lime and fertilizer, as needed, to establish protective vegetation.

We appreciate the opportunity to comment on this proposed project.

Sincerely yours,

Robert L. Hilliard

Robert L. Hilliard
State Conservationist

cc: Kenneth E. Grant, Administrator, SCS, Washington, D.C.
Dr. Fred H. Tschirley, Acting Coordinator, Office of Environmental Quality Activities, Office of the Secretary, USDA, Washington, D.C.
Council on Environmental Quality, Washington, D.C. (5 copies)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

JAN 27 1975

Class. LO-2

Major Byron G. Walker
Deputy District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Walker:

We have reviewed the draft environmental impact statement (EIS) for the Feasibility Study for Flood Control and Related Purposes, Cazenovia Creek, Buffalo Metropolitan Area, New York and have the following comments.

EPA is in agreement with the Corps' use of nonstructural measures to help control flooding hazards. Nonstructural measures can reduce the potential economic impacts of flooding while at the same time they allow the floodplain to continue its natural functions.

The EIS mentions that the turbidity and sedimentation resulting from construction and maintenance programs could destroy spawning beds and smother benthic organisms. The final EIS should discuss the type and extensiveness of the spawning beds which are located in the project area.

Ice-breaking methods have been used fairly successfully in the past to prevent ice jams which produce flooding hazards. Will the dam remove this necessity or will ice breaking still be required in certain areas, such as below the Cazenovia Street Bridge? In other words will ice-jamming floods still be possible below the dam? If so, then how often will they occur and how do they affect the need for the dam?

While summer daytime water quality data are included in the EIS, there are no seasonal or diurnal water quality data. Since this information is required to determine if anoxic conditions could occur in the permanent pool, this information should be included in the final EIS.

Thank you for the opportunity to review this EIS. Three copies of the final EIS are requested for subsequent review.

Sincerely yours,

for Paul H. Arbesman
Chief
Environmental Impacts Branch

NEW YORK STATE PARKS & RECREATION South Swan Street Bldg Empire State Plaza Albany New York 12238 Information 518 474 0456
Alexander Aldrich, Commissioner

March 10, 1975

Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Att: NCBED-ER

Re: Feasibility Study of Casenovia Creek
Erie County, New York
Draft Environmental Statement

Gentlemen:

The Division for Historic Preservation, functioning in its capacity as the staff of the State Historic Preservation Officer, has reviewed both the archeological literature survey and Draft Environmental Statement concerning Cazenovia Creek.

Please note that the Draft Environmental Statement contains one discrepancy. In the Summary statement it is mentioned that the Federal Register was consulted for National Register listings and that none exist in the vicinity of proposed project work. Page 77 (sec. 2.121) mentions the Millard Fillmore birthplace. The birthplace of Millard Fillmore was recently named a National Historic Landmark, and is therefore listed on the National Register of Historic Places.

The literature survey and the DEIS as it reflects that search appear to be adequate as evidence of a preliminary investigation. However, on the basis of Dr. White's research, we recommend that further archeological work be done. On-site archeological surveys should be made in the project locations where the land will be disturbed in any way.

Sincerely yours,

Diana S. Waite
National Register and
Survey Coordinator
Division for Historic Preservation

DSW/LMR/jf

cc: Dr. Robert E. Funk, State Archeologist
Dr. Ellis E. McDowell, SUNY at Cortland, New York
Mr. John D. McDermott, Compliance Officer, Advisory Council on Historic Preservation
Mr. Jerry D. Wagers
Dr. Marian White

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Ogden Reid,
Commissioner

February 20, 1975

Mayor Byron G. Walker
Deputy District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mayor Walker:

Draft Environmental Impact Statement
Phase II Feasibility Study for Flood Control
Cazenovia Creek, Erie County, New York
DEC Project No. 915-99-0126

We have reviewed the above noted document and believe that the statement is generally accurate and complete. The following comments are illustrative of our concerns:

1. Erosion control measures and vegetative plantings should be installed on disturbed areas immediately upon the completion of construction in order to minimize siltation in the stream.

   Temporary erosion control measures should be used if disturbed areas are to be left unprotected for any considerable length of time.

2. Consideration should be given to planting vegetation to compensate for lost wildlife habitat. Planting wildlife shrubs and conifers in open areas adjacent to the dam and a shrub corridor around the north end of the dam would have a mitigating effect on wildlife.

3. Provisions should be made to minimize land clearing and construction activities during the period that bird and mammal reproductive nesting occurs. This activity normally occurs between May 1 and June 30.

4. The statement indicates that the ice retention pool will be periodically drained for sediment removal. However, sedimentation rates, which will affect the frequency of sediment removal, and disposal sites for the removed sediment should be discussed. The USDA Soil Conservation Service has recently completed an Erosion and Sediment Inventory (E.A.S.I.) for New York and should be consulted for determining the sediment load that can be expected at the ice retention structure.

5. The statement recognizes that the pool may be subject to stagnation. It appears from the nature of the stream that the stagnation may be a yearly problem during the summer months. A discussion of the procedures and the agency responsible for monitoring conditions in the pool that favor stagnation should be presented. If the pool is not continually monitored, consideration should be given to draining the pool every year prior to the summer season.

6. The statement should indicate whether construction activities or operation of the project will periodically interrupt stream flow. Measures should be taken to insure that a sufficient flow of water to sustain aquatic life downstream is maintained at all times.

Thank you for the opportunity to review this statement. We would like two copies of the Final E.I.S. when it is available.

Very truly yours,

Terence P. Curran

Terence P. Curran
Director of Environmental Analysis

HOLLIS S. INGRAHAM, M.D.
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF HEALTH

REGIONAL OFFICE
584 DELAWARE AVENUE
BUFFALO, NEW YORK 14202

LAVERNE E. CAMPBELL, M.D.
REGIONAL HEALTH DIRECTOR

December 9, 1974

Major Byron G. Walker
Deputy District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, N.Y. 14207

Re: Phase II Feasibility
Study for Flood Control
Cazenovia Creek
Erie County

Dear Major Walker,

This office has reviewed the draft environmental statement on the above subject project.

The area involved has suffered considerably in past years from flood damage and the proposed project would provide much needed relief.

Cazenovia Creek is not utilized as a source for municipal water supply. Residents along the upper reaches of Cazenovia Creek derive their water supply from individual wells and springs. In either case, the proposed project will have no adverse affect on the quality and quantity of drinking water to the communities and residents involved.

The plan provides added protection to the public through land use controls by flood plain zoning and subdivision regulations. Through proper municipal planning and zoning, additional recreational benefits can also be derived.

This office supports the project as it fulfills an immediate and serious need.

I recommend that the Erie County Health Department be given an opportunity to review and comment on the study.

Very truly yours,

Louis M. Violanti

LMV/baa

Louis M. Violanti, P.E.
Regional Director of Public
Health Engineering

cc: David Barry - Erie County Health Department
Eugene J. Cahalan - Program Planning & Analysis
Dr. Campbell - Buffalo Regional Office

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
ALBANY, NEW YORK 12224

NEW YORK STATE MUSEUM AND SCIENCE SERVICE

ANTHROPOLOGICAL SURVEY

February 18, 1975

Colonel Bernard C. Hughes
District Engineer
Department of the Army
Buffalo District
Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

We have reviewed the Draft Environmental Impact Statement for the Cazenovia Creek flood control project and the report on cultural resources prepared by Dr. White, S.U.N.Y. Buffalo.

Given the characteristics of both the area and of the project itself, we recommend that an archeological survey be carried out prior to construction, conducted by professional archeologists experienced in such work.

We suggest that you negotiate directly with Dr. White for the completion of such a survey, and that you keep us apprised of the progress of this procedure.

We will be glad to review further any aspects of this process as you may desire, and feel free to contact us at any time.

Sincerely yours,

Robert E. Funk

Robert E. Funk
State Archeologist

REF:dm

New York Archaeological Council

February 6, 1975

District Engineer
Buffalo District
U.S. Army Corps of Engineers
1776 Niagra St.
Buffalo, NY 14207

Dear Sir:

I have recently received a copy of your Draft Environmental Statement on the Feasibility Study of Cazenovia Creek, and also a copy of the comments provided you on January 16 by the Department of the Interior requesting on-site archaeological surveys during preparation of the Final ES. I assume from my perusal of the Draft that you are engaged in a General Investigation on Cazenovia Creek and are not yet approaching preparation of a General Design Memorandum. A sample field reconnaissance and literature study to develop regional predictions of potential archaeological impact and a comparative framework for making judgements of archaeological significance would appear to be appropriate at this level. We would be happy to prepare a proposal for such a study, or for any more intensive work you think necessary to your planning. Please feel free to contact me about this or other projects at the address and phone number given below.

Sincerely yours,

Thomas F. King
Administrator

4242 Ridge Lea Road, Buffalo, New York 14226 Tel. (716) 831-1144

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
BUFFALO AREA OFFICE
GRANT BUILDING, 560 MAIN STREET, BUFFALO, NEW YORK 14202

September 14, 1976

REGION II
26 Federal Plaza
New York, New York 10007

IN REPLY REFER TO:
2.2CS/WS

Mr. Marvin W. Rees
Executive Director of Civil Works
DAEN-CWP-A
Department of Army
Office of the Chief of Engineers
Washington, D.C. 20314

Dear Mr. Rees:

Subject: Draft Environmental Impact Statement, Buffalo district, Corps of Engineers Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed

A review of the Interim Report on Feasibility of Flood Management in Cazenovia Creek Watershed indicates; that this project is consistent with HUD objectives and should make residential development more attractive in the Cazenovia Creek Watershed Area.

Sincerely,

Frank D. Cerabone
Area Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

Class. LO-1

OCT 1 1976

Colonel Bernard C. Hughes
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

We have reviewed the Addendum to the Cazenovia Creek Revised Draft Environmental Impact Statement (EIS) concerning archaeological resources and are somewhat confused as to how an addendum to a revised draft EIS can be issued before the revised draft EIS.

Nevertheless, our review of the addendum and an unofficial copy of the revised draft EIS obtained from the Buffalo District Office, indicates that the proposed project should not produce significant adverse environmental impacts.

In accordance with EPA procedures, we have rated the revised draft EIS and the addendum as LO-1, indicating that we lack objection to the project as proposed (LO) and that the environmental impacts of the project are adequately set forth in the documents (1).

If you have any questions concerning this letter, please feel free to contact our office at 8-264-8556. A copy of the final EIS is requested for subsequent review.

Sincerely yours,

Barbara Metzger

Barbara M. Metzger
Chief
Environmental Impacts Branch

'ILE COPY
Checked by
Filed by

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

6 October 1976

Lieutenant General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D.C. 20314

Dear General Morris:

The Department's New York Regional Office has reviewed the draft environmental impact statement concerning the Cazenovia Creek Watershed, New York. On the basis of this review, we feel that impacts in those areas of concern to this Department have been adequately addressed.

Thank you for the opportunity to review the document.

Sincerely,

Charles Custard
Director
Office of Environmental Affairs

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

29 October 1976

Lieutenant General J. W. Morris
Chief of Engineers
Office of the Chief of Engineers
Army Corps of Engineers
U.S. Department of the Army
Washington, D.C.

Dear General Morris:

In accordance with your letter of August 9, 1976, we have reviewed the report and the revised draft environmental impact statement on Cazenovia Creek Watershed, New York.

The proposed works involve the ponding of floodwaters to reduce the incidence of ice jamming. However, the area affected by ponding floodwaters is not discussed with the precision that characterizes much of the report. On page 72 (Main Report) we note reference to impacts on "approximately 20 acres of agricultural land and 75 acres of undeveloped scrubland." Presumably, some current farm uses of land will be displaced by the project. A further description of the farmland, the intensity of its use, identification of prime farmland soils, and impacts on these by the project would be appropriate and should also be included in the environmental impact statement.

We appreciate the opportunity to review and comment on these reports.

Sincerely,

Paul A. Vander Myde

PAUL A. VANDER MYDE
Deputy Assistant Secretary

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-76/784

NOV 5 1976

Dear General Morris:

Thank you for the letter of August 11, 1976, requesting our views and comments on the draft environmental statement and interim report for Flood Management in Cazenovia Creek Watershed, Erie County, New York. We have reviewed the documents and conclude that they adequately considered those areas within our jurisdiction and expertise. We are especially pleased with the consideration the Corps of Engineers has given to most of our previous comments. However, we wish to reiterate the concern expressed in our letter of January 9, 1975, that "The ice-retention dam area could well serve as an important link in a continuous trail system along the Cazenovia Creek. We believe the possibility of such a trail system, and the importance of the proposed project to it, should be explored more fully in the final statement, and copies of any agreements reached be made a part of that statement."

We do not believe the response to this comment, which is included in the subject document, fully addresses our concern. The final statement should include copies of relevant communications with the Erie-Niagara Counties Regional Planning Board attesting to the compatibility of the project with their Regional Recreation Plan. In the event that post-authorization studies indicate that the project site would serve as an important link in a streamside trail system, the project should be designed to incorporate suitable rights-of-way, gradients and such other allowances as are necessary for trail construction. In this way, the project will not merely be compatible with existing recreation plans, but will provide an existing base for the implementation of these plans.

Sincerely yours,

(Sgd) Stanley D. Dorenan

Secretary of the Interior

Deputy Assistant

Lt. General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D. C. 20314

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

• 11 November 1976

Lieutenant General J. W. Morris
Chief of Engineers
Department of the Army
Washington, D. C. 20314

Dear General Morris:

This is in response to your letter of 9 August 1976 addressed to Secretary Coleman concerning a revised draft environmental impact statement on Cazenovia Creek and Cayuga Creek Watershed, Buffalo, Erie County, New York.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

D. J. RILEY
Captain, U. S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

PETER A. A. BERLE
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233

January 13, 1977

Dear Colonel Creel:

This is in reply to your letter of December 16, 1976, and the earlier letter of August 9, 1976, from General Morris regarding the proposed report of the Chief of Engineers on Cazenovia Creek Watershed, New York. Department staff have worked closely with Buffalo District during development of the feasibility report and EIS and have provided detailed comments upon the draft reports.

The proposed final report reflects the comments provided to the District and this Department has no further comments to offer on behalf of New York State. The State strongly supports the authorization by Congress of the plan proposed by the Chief of Engineers.

Sincerely,

Peter A. A. Berle

Colonel Tilford C. Creel
Assistant Director of Civil Works,
Upper Mississippi Basin and Great Lakes
Department of the Army
Office of the Chief of Engineers
Washington, DC 20314

APPENDIX B

LETTERS OF COORDINATION

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

10 May 1974

Alexander Aldrich, Commissioner
Parks and Recreation
303 South Swan Street Building
Albany, NY 12223

Dear Mr. Aldrich:

We are currently preparing a draft environmental impact statement for proposed improvements on Cazenovia Creek in the Town of West Seneca, Erie County, NY. Major features of the proposed project include construction of levees along the north bank of the creek, approximately between Ridge Road and Mill Road, and realignment of a portion of the existing creek channel that is adjacent to the Southgate residential area.

In order to fully assess the environmental impacts associated with this proposal it is necessary to know what impacts the proposed project will have upon the historical, archaeological and paleontological resources of the West Seneca area, particularly those listed in the National Register of Historic Places. Impacts upon cultural resources, environmental educational landmarks, and natural landmarks must also be considered.

Therefore, we would be most pleased if you would examine the proposed project area and make the appropriate determinations as outlined above. A brief project description and location maps are inclosed for your reference.

We would be most pleased if you would reply by 31 May 1974. If we can be of any further assistance, please do not hesitate to notify us.

Sincerely yours,

Charles T. Myers III

CHARLES T. MYERS III
Major, Corps of Engineers
Acting District Engineer

Incl
as stated

NEW YORK STATE PARKS & RECREATION South Swan Street Bldg South Mall, Albany, New York 12223 Information 518 474 0456
Alexander Aldrich, Commissioner

May 22, 1974

Major Charles T. Myers III
Acting District Engineer
Corps of Engineers, Buffalo
District
1776 Niagara Street
Buffalo, NY 14207

Dear Major Myers:

Thank you for the opportunity to comment on your plans for improvements on Cazenovia Creek in the Town of West Seneca, Erie County.

An area on Cazenovia Creek, just upstream of your proposed project area, has been considered for acquisition and development of a state park. The two areas are shown on the attached map of the West Seneca area. We understand that there are also projected Corps of Engineers' projects for this upstream portion of the Creek. We would like to ask that in planning these projects, as well as the present improvement proposal, you consider the probability of a continuous trail system which would utilize the banks of the river. Such a trail system to connect open space areas could be readily accommodated through the use of improvements such as levees, etc.

Again, thank you for informing us concerning this project.

Sincerely,

Ruth Monson

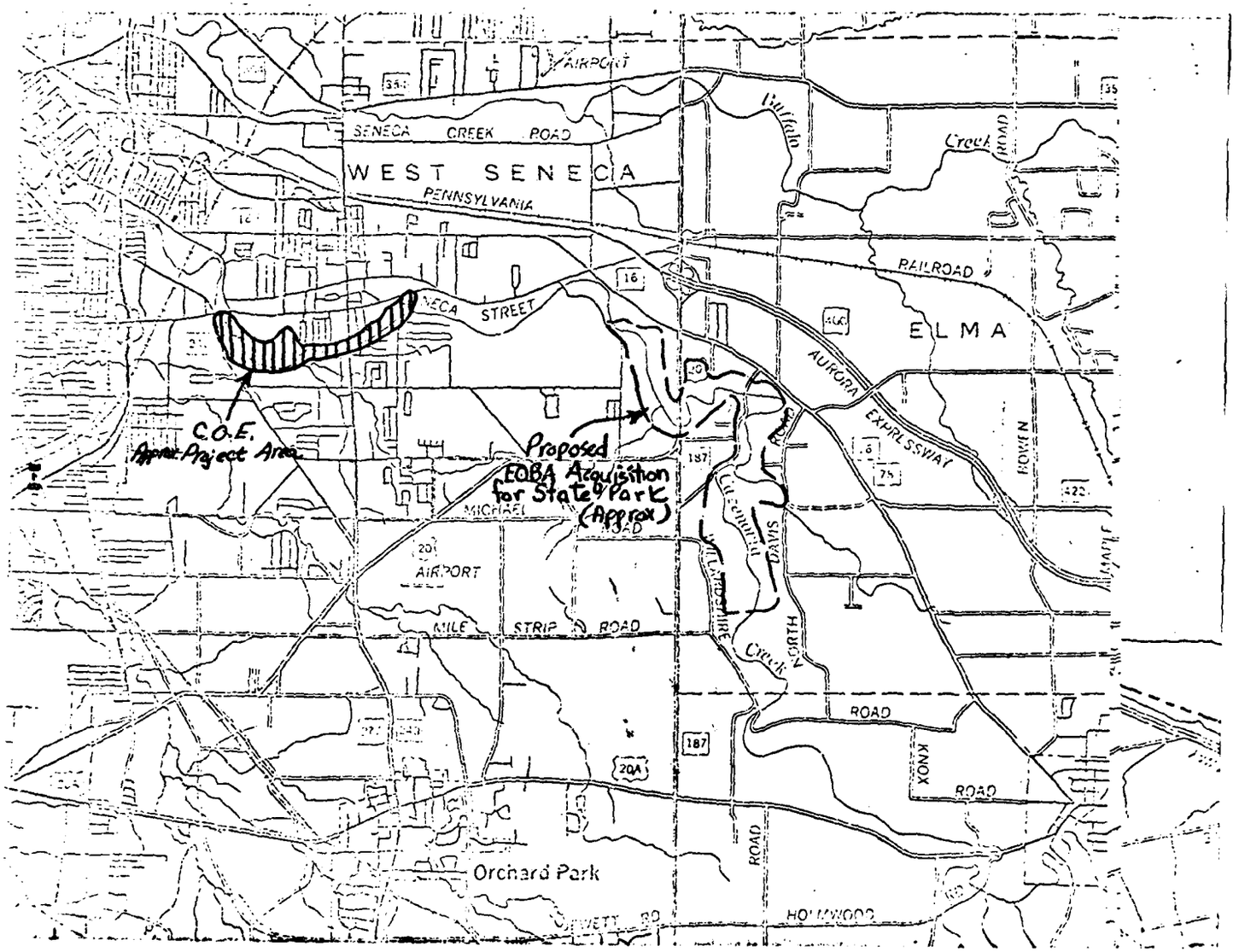
Ruth Monson
Senior Environmental Analyst

for

IVAN P. VAMOS, Director
Planning and Research

RM:kb

Attachment


AIRPORT
SENECA CREEK ROAD
WEST SENECA
PENNSYLVANIA
RAILROAD
SENECA STREET
ELMA
AURORA EXPRESSWAY
C.O.E. Project Area
Proposed EOBA Acquisition for State Park (Approx)
MICHAEL ROAD
AIRPORT
MILE STRIP ROAD
ROAD
KNOX
ROAD
Orchard Park
HOLLYWOOD

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

10 May 1974

Chester L. Brooks, Regional Director
Mid-Atlantic Region
National Parks Service
U. S. Department of the Interior
143 South 3rd Street
Philadelphia, PA 19106

Dear Mr. Brooks:

We are currently preparing a draft environmental impact statement for proposed improvements on Cazenovia Creek in the Town of West Seneca, Erie County, NY. Major features of the proposed project include construction of levees along the north bank of the creek, approximately between Ridge Road and Mill Road, and realignment of a portion of the existing creek channel that is adjacent to the Southgate residential area.

In order to fully assess the environmental impacts associated with this proposal it is necessary to know what impacts the proposed project will have upon the historical, archaeological and paleontological resources of the West Seneca area, particularly those listed in the National Register of Historic Places. Impacts upon cultural resources, environmental educational landmarks, and natural landmarks must also be considered.

Therefore, we would be most pleased if you would examine the proposed project area and make the appropriate determinations as outlined above. A brief project description and location maps are inclosed for your reference.

We would be most pleased if you would reply by 31 May 1974. If we can be of any further assistance, please do not hesitate to notify us.

Sincerely yours,

Charles T. Myers III

CHARLES T. MYERS III
Major, Corps of Engineers
Acting District Engineer

Incl
as stated

United States Department of the Interior

NATIONAL PARK SERVICE

NORTH ATLANTIC REGION
150 CAUSEWAY STREET
BOSTON, MA. 02114

IN REPLY REFER TO:

L-7619
NAR-(CE)

JUN 10 1974

Major Charles T. Myers III
Acting District Engineer
Department of the Army
Buffalo District Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Major Myers:

This will confirm a telephone response of June 6 by David Clark of this office to your letter request of May 10, addressed to Chester Brooks, Regional Director of our Mid-Atlantic Region, concerning the preparation of your draft environmental impact statement for proposed improvements on Cazenovia Creek, Town of West Seneca, Erie County, New York. Upon review of the material you sent and consideration of the area of the project, we feel the project would have no adverse affect upon any existing, proposed or known potential units of the National Park System, or any known historic, natural or environmental education sites eligible for the National Landmark Programs.

We would, however, suggest that you maintain contact with the State Historic Preservation Officer (Commissioner of Parks and Recreation, Room 303, South Swan Street Building, Albany, New York 12226) and this Regional Office regarding archeological matters during the course of the project work, should any unknown cultural resources be revealed and their protection accordingly considered.

Sincerely yours,

Regional Director

JOHNNY HORIZON '76

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

30 December 1974

Mr. Alexander Aldrich
Commissioner, New York State Parks and Recreation
303 South Swan Street Building
Albany, NY 12223

Dear Mr. Aldrich:

The Buffalo District Office of the U.S. Army Corps of Engineers is currently preparing a feasibility study of Cazenovia Creek for a proposed flood control project.

Dr. Marian White, Professor of Archaeology at the State University of New York at Buffalo, performed a literature search survey with respect to this proposed project. Inclosed is a copy of the literature survey. The Draft Environmental Statement for the Cazenovia Creek project was forwarded to your office in November.

I would appreciate your comments on the archaeological literature survey and Draft Environmental Statement, and a recommendation as to whether or not additional cultural resource surveys would be required.

Sincerely yours,

Byron S. Walker MAJ, CE
for BERNARD C. HUGHES
Colonel, Corps of Engineers
District Engineer

1 Incl
as stated

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

30 December 1974

Dr. Robert Funk
State Archeologist
N.Y.S. Museum & Science Service
Education Building
Room 438
Washington Avenue
Albany, NY 12234

Dear Dr. Funk:

The Buffalo District Office of the U.S. Army Corps of Engineers is currently preparing a feasibility study of Cazenovia Creek for a proposed flood control project.

Dr. Marian White, Professor of Archaeology at the State University of New York at Buffalo, performed a literature search survey with respect to this proposed project. Inclosed is a copy of the literature survey together with a copy of the Cazenovia Creek Draft Environmental Statement.

I would appreciate your comments on the archaeological survey and Draft Environmental Statement, and a recommendation as to whether or not additional cultural resource surveys would be required.

Sincerely yours,

Bernard S. Walker MAJ, CE
BERNARD C. HUGHES
for Colonel, Corps of Engineers
District Engineer

2 Incls
as stated

United States Department of the Interior

NATIONAL PARK SERVICE

NORTH ATLANTIC REGION
150 CAUSEWAY STREET
BOSTON, MA. 02114

IN REPLY REFER TO:
L-7619-NAR-(CE)
NCBED-PB

DEC 9 1974

Colonel Bernard C. Hughes
District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Hughes:

This is in response to your letter of 22 November inviting our comments on the draft Phase II report (a Syllabus and a Feasibility Report) on Cazenovia Creek, New York proposed flood control project. We note extensive discussion given to natural and cultural resources of the project area, particularly cultural on pages 16 and 17 of the Syllabus and pages B-66-68 of the interim (Draft) Feasibility Report.

In keeping with our comments of June 10 to Major Meyers on an environmental statement under preparation for this project, we would suggest that contact be made with the State Historic Preservation Officer to determine what sites, if any, on the state's inventory may be adversely affected by this project. Also, a competent archeological overview should be given to the project area. For this purpose the state archeologist (Dr. Robert Funk, New York State Museum and Science Service, Albany, New York) should be initially contacted and appropriate follow through accomplished from his advice. Should any archeological finds be made or significant possibility be indicated, we can further advise on procedures. The outcome of these cultural resource considerations should be expressed in the environmental statement and any conclusive comments by the State Historic Preservation Officer and Archeologist should be appended to the final statement and also to the draft statement if available.

We anticipate a Departmentally consolidated review of the draft environmental statement on this matter, therefore our comments now must be understood to pertain to the concerns of the National Park Service only.

Sincerely yours,

B-8

Jerry D. Wagers

Jerry D. Wagers
Regional Director

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-ER

30 December 1974

U.S. Department of the Interior
National Park Service
North Atlantic Region
150 Causeway Street
Boston, MA 02114

Dear Mr. Wagers:

With regard to your letter dated 9 December 1974, a literature search of the Cazenovia Creek project area was conducted by Dr. Marian White, Professor of Anthropology at the State University of New York at Buffalo.

A copy of Dr. White's literature search survey has been forwarded to the State Historic Preservation Officer, Mr. Alexander Aldrich, and to the State Archaeologist, Dr. Robert Funk for their review and comment. A copy of the Cazenovia Creek Draft Environmental Statement has also been forwarded to Mr. Aldrich and Dr. Funk.

Upon receipt of comments from the State Historic Preservation Officer and the State Archaeologist, a copy of their assessment regarding natural and cultural resources will be forwarded to your office.

Sincerely yours,

BERNARD C. HUGHES
Colonel, Corps of Engineers
District Engineer

New York State Department of Environmental Conservation
Division of Fish & Wildlife
128 South Street
Olean, New York 14760

Ogden Reid
Commissioner

February 28, 1975

Colonel Bernard Hughes
District Engineer
1776 Niagara Street
U.S. Army Corps of Engineers
Buffalo, New York 14207

Attn: NCBED-PE

Dear Colonel Hughes:

This letter is a response to your request for information on the fishery in Cazenovia Creek, Town of West Seneca, and is in regard to a proposed ice retention structure upstream of Mill Road Bridge.

The most recent data of interest to you was collected August 14, 1967 when 200 feet of stream were electrofished at Mill Road. The following species of fish were observed along with their relative abundance (A-abundant, C-common, R-rare):

Smallmouth bass	Micropterus dolomieui	C
Rock bass	Ambloplites rupestris	A
Common sucker	Catostomus commersoni	C
Hog sucker	Hypentelium nigricans	C
Common shiner	Notropis cornutus	A
Stoneroller minnow	Campostoma anomalum	A
Hornyhead chub	Hybopsis biguttata	R
Stonecat	Noturus flavus	R
Greenside darter	Etheostoma blennioides	R

On June 12, 1973 Cazenovia Creek was electrofished from its mouth upstream to a point approximately 4.5 miles below the location of the proposed ice retention structure. No attempt was made to collect small minnows. Species of fish collected were:

Smallmouth bass	Micropterus dolomieui	C
Sunfish	Lepomis gibbosus	C
Bluegill	Lepomis macrochirus	C
Rock bass	Ambloplites rupestris	R
Sheepshead	Aplodinotus grunniens	C
White sucker	Catostomus commersoni	C
Hog sucker	Hypentelium nigricans	R
Redhorse sucker	Moxostoma sp.	C
Carp	Cyprinus carpio	A
Quillback carpsucker	Carpiodes cyprinus	C

On August 14, 1967, the following species were collected at a point almost three miles upstream of the proposed ice retention structure:

Brown bullhead	Ictalurus nebulosus	R
White sucker	Catostomus commersoni	C
Hog sucker	Hypentelium nigricans	C
Common shiner	Notropis cornutus	A
Stoneroller minnow	Campostoma anomalum	A
Longnose dace	Rhinichthys cataractae	C
Creek chub	Semotilus atromaculatus	C
Stonecat	Noturus flavus	R
Greenside dace	Etheostoma blennioides	R

The entire Cazenovia Creek from its mouth to the junction of its East and West Branches, 16.7 miles, is managed for smallmouth bass with the notation that natural spawning is adequate. Both juveniles and adults are commonly observed.

For a nest site, members of the species prefer a firm bottom, usually gravel, in shallow water. When sand, gravel or rock are unavailable, smallmouth bass have been known to use silt, clay or some other soft bottom. More often than not, the location of the nest is adjacent to a protecting bank, log, boulder, or other object. The completed nest is usually a saucer-shaped depression a few inches deep and 2 or 3 feet in diameter. The eggs stick to clean stones or other material in the bottom of the nest.

Our file data lists the bottom type for the section of Cazenovia Creek under consideration as gravel, rubble, silt and bedrock. I do not believe the spawning habitat is limiting to smallmouth bass survival here. Only a few successfully reared broods would be needed to replenish the population anyhow. Other than spawning habitat, ideal stream habitat would include adequate cover and shelter, deep pools alternating with gravel or rocky riffs, and water temperatures that do not exceed 80°F. The numerous wide, shallow bedrock areas of the Cazenovia contribute to summer water temperatures as high as 85°F. Food organisms are less plentiful on a substrate composed purely of this shale bedrock.

I hope this information will be useful to you.

Very truly yours,

James K. Pomeroy
Conservation Biologist
Region 9

For Charles N. Frisa
Regional Fisheries Mgr.
Region 9

CNF/JKP/dcs

ERIE & NIAGARA COUNTIES REGIONAL PLANNING BOARD

Leo J. Nowak, Jr.
DIRECTOR

May 28, 1975

Board of Engineers for Rivers
and Harbors
Kingman Building
Fort Belvoir, Virginia 22060

SUBJECT: Report on Buffalo Metropolitan Area, New York.
Interim Report on Flood Management for
Cazenovia Creek Watershed

Gentlemen:

The staff and the Utilities Committee of the Erie and Niagara Counties Regional Planning Board has reviewed the specified report and is transmitting their findings in the form of a statement for your consideration.

Sincerely yours,

Robert Floyd

Robert Floyd, P.E.
Senior Civil Engineer

RF:sy
Enc.

cc: Col. Bernard C. Hughes, Dist. Eng.
United States Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

ERIE AND NIAGARA COUNTIES REGIONAL PLANNING BOARD STATEMENT FOR THE FEASIBILITY STUDY OF CAZENOVIA CREEK-INTERIM REPORT FOR FLOOD CONTROL

A public statement was presented by Raymond Griffin, Chairman of the Utilities Committee of the Erie and Niagara Counties Regional Planning Board at the Corps of Engineers, Buffalo District public hearing on June 21, 1974.

The proposals presented at this meeting were thoroughly evaluated and compared to the following Regional Planning Board programs:

1. Adopted Land Use Concept
2. Adopted Recreation and Open Space Plan
3. Adopted Regional Water Supply Plan and Program
4. Adopted Regional Sanitary Sewerage Plan and Program
5. Storm Drainage Management Plan

Since the proposals at the June 21, 1974 public hearing included remedial measures and land use controls for Reach 2 and Reach 3, the Regional Planning Board went on record as being in favor of the proposed plans and indicated that the proposed plans were consistent with the Regional Plans and Programs. However, strong emphasis was placed on the fact that a single regional solution consisting of Reach 2 and Reach 3 with the addition of the structural measures for Tannery Brook was more beneficial to the region than solutions for individual and separate reaches as proposed by the Corps of Engineers.

The Regional Planning Board has reviewed the Corps of Engineers' Report on Buffalo Metropolitan Area, New York Interim Report on Flood Management for Cazenovia Creek Watershed, November 1974. The proposals reflected in this report differ to a high degree from the proposals submitted by the Corps of Engineers at the June 21, 1974 Public Hearing. The only structural feature now being proposed is that of an ice retention structure in one segment of the Creek.

After a thorough review, the Regional Planning Board would like to go on record as not being in favor of the proposals in the November, 1974 report because a singular solution in one segment of the Creek is not consistent with the regional programs and plans developed to date.

The Regional Planning Board reiterates its emphasis on a regional solution in order to provide maximum flood protection for the entire watershed of Cazenovia Creek and recommends that the original proposals for the other reaches of the Creek be included in the final report.

jay
5/21/75

NCBED-PN 26 April 1977

Mr. Robert Floyd, P.E.
Senior Civil Engineer
Erie & Niagara Counties Regional
Planning Board
Northtown Plaza
3103 Sheridan Drive
Amherst, NY 14226

Dear Mr. Floyd:

This letter concerns your letter of 22 May 1975 to the Board of Engineers for Rivers and Harbors and a recent telephone conversation with Mr. Daniel Kelly of my staff concerning the views of the Erie and Niagara Counties Regional Planning Board (ENCRPB) on the Corps recommended flood control project for Cazenovia Creek.

It is my understanding that the ENCRPB is not opposed to the ice retention project but desire a more regional solution to provide additional flood protection in the Cazenovia Creek basin. More specifically, the ENCRPB favors a plan that would include construction of levees in Reach 3 near the Southgate Plaza and structural measures for Tannery Brook in East Aurora.

As shown in our March 1975 Feasibility Report and as discussed with Mr. Kelly, local protection measures for these areas were investigated but in the final analyses were found to be economically unfeasible as independent projects. Corps regulations do not allow us to add up costs and benefits for measures along several separated reaches to arrive at a cost effective project. The measures for each area must be incrementally justified on their own merit.

The ice retention structure, by trapping ice floes moving down Cazenovia Creek, provides a 125-year level of protection in Subreach 3B, where most of the damage occurs, and a lesser degree of protection in other downstream subreaches. No other structural measure considered was as cost effective as the ice retention structure in providing the same or a lesser degree of protection throughout the lower basin. To increase the degree of protection, other measures, in combination with the ice

retention structure, were considered to protect against flooding caused by free flows. The only area downstream of the ice retention structure where substantial average annual damages remain is Subreach 1A in the city of Buffalo. Floodwalls were considered in this reach in combination with the ice retention structure but again the floodwalls could not be incrementally justified.

When levees were being considered in the Reach 3 area, a number of residents expressed concern over the visual and environmental impact of constructing levees through the area.

Implementation of the ice retention structure does not preclude non-Corps construction of other measures desired by local interests in the Cazenovia Creek basin.

I would be glad to discuss this matter in greater detail if you wish.

Sincerely yours,

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

APPENDIX C

GLOSSARY OF TERMS

AERATION - The process by which air and other gases in a medium are renewed or exchanged.

ALGAE - Small aquatic plants containing chlorophyll and having no vascular conducting system.

ALLUVIUM - Material deposited by running water.

AMORTIZE - To provide for the gradual extinguishment of debt by contributing to a sinking fund at the time of each periodic interest payment.

ANAEROBIC - Condition in which oxygen is absent.

ANNUAL PLANT - Plant having a life span of one year.

AQUIFER - A body of rock strata containing sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

ARGILLACEOUS - Pertaining to Argillite, a compact rock derived from mudstone or shale.

BENTHIC - Relating to or occurring at the bottom of a body of water.

BIOTA - The flora and fauna of a region.

BIOMASS - The amount (mass) of living matter supported by an environment.

BOD - Biochemical oxygen demand; a water quality parameter which specifies the amount of oxygen needed by organisms while consuming organic material in the water.

CFS - Cubic feet per second; 1 cfs = 450 gallons per minute.

CALCAREOUS - Containing calcium carbonate.

CARRYING CAPACITY - The number of animals an area can support over an indefinite period of time.

CLIMAX - The final, self-perpetuating plant and animal community or sere in an ecological succession.

COD - Chemical oxygen demand; a parameter of water quality which specifies the quantity of oxidizable material in a water sample.

COLIFORM - Group of bacteria, primarily inhabitants of the mammalian digestive tract.

COLLUVIUM - Thick, sorted glacially derived deposits.

CONCRETION - A hard, compact, rounded, normally subspherical mass or aggregate of mineral matter formed by precipitation from aqueous solution in pores of sedimentary rock.

DECIDUOUS - Losing all of its leaves yearly at the end of the growing season.

DELTAIC - Associated with deposits dropped at the mouth of a stream or river.

DESIGN DISCHARGE - The quantity of flow in a stream at any given time that a flood control structure is designed to accommodate.

DEVONIAN - The period of geologic time immediately preceding the Pennsylvanian dating approximately from 320 to 270 million years ago.

D.O. - Dissolved oxygen - the amount of oxygen dissolved in water; approximately 4 to 14 parts per million dissolved oxygen are required to support game fish.

ECOSYSTEM - A complex of producer, consumer, and decomposer organisms and their environment, which forms a functioning whole in nature; a rotten log, a pond, or a desert are examples of ecosystems of varying sizes.

EFFLUENT - An outflow.

EPILIMNION - The uppermost layer of water in a lake, characterized by an essentially uniform temperature that is generally warmer than elswhere in the lake and by a relatively uniform mixing caused by wind and wave action.

EUTROPHICATION - Refers to bodies of water, which are rich in mineral nutrients and organic materials, therefore productive. Oxygen may be deficient seasonally.

EVAPOTRANSPIRATION - Loss of water from the soil both by evaporation and by transpiration from plants.

FAUNA - The animal life inhabiting a specific area.

FETCH - The distance of open water across which the wind blows; an important determinant of wave height.

FILAMENTOUS ALGAE - Algae whose cells are joined end to end form tiny filaments.

FLOCCULATION - The aggregation of suspended colloidal material or flat, low-lying area adjacent to a river or stream which is prone to frequent flooding.

FLOODPLAIN - The relatively flat area or lowlands adjoining the channel of a river, stream or watercourse or ocean, which has been or may be covered by flood water.

FLORA - The plant life inhabiting a specific area.

FLUVIO - Associated with running glacial meltwater.

FOOD CHAIN - The passage of energy and materials from producers through a progressive sequence of plant-eating and meat-eating consumers.

FORAGE FISH - A fish species which feeds on plant life and animal remains.

HABITAT - The sum total of environmental conditions of a specific place that is occupied by an organism, a population, or a community.

HYPOLIMNION - The lower most layer of water in a lake, characterized by an essentially uniform temperature, that is generally colder than elsewhere in the lake, and often by relatively stagnant or oxygen-poor water.

KAME & KETTLE - *Topography* characterized by adjacent hills and depressions, formed by wasting glacial ice.

LACUSTRINE - Descriptive term for material deposited in standing water.

LEACH - To subject to the action of percolating water or other liquid in order to separate the soluble components.

LIMNOLOGY - Study of lakes.

LITTORAL - Of or relating to the shore of a lake or ocean.

MACROPHYTE - A plant that is larger than microscopic.

MARL - A term loosely applied to a variety of materials most of which occur as soft, loose, earthy, and semifriable or crumbling unconsolidated deposits consisting chiefly of an intimate mixture of clay and calcium carbonate in varying proportions, formed under either marine or especially fresh water conditions.

MORAINE - An accumulation of earth and stones carried and finally deposited by a glacier.

NICHE - The position or status or an organism within its ecosystem resulting from the organisms's structural adaptations, physiological responses and specific behavior.

OUTWASH PLAIN - A plain composed of material washed out of a melting glacier. It is usually sandy or gravelly and very flat.

OVERBURDEN - Material which overlies a deposit of useful materials, ores or coal, especially those deposits that are mined from the surface of open cuts.

pH - A measure of the number of hydrogen ions in a solution; if the pH exceeds 7, the solution is considered to be basic, if less that 7, it is acidic.

PASSERINE BIRDS - Passeriformes: Largest order of birds consisting chiefly of song birds with perching habits.

PALEOZOIC - An era of geologic time, from the end of the pre-Cambrian to the beginning of the Mesozoic.

PIEZOMETRIC - An imaginary surface representing the static head of ground water and defined by the level to which water will rise in a well.

PHYTOPLANKTON - Planktonic life belonging to the plant kingdom.

PLANKTONIC - Free floating.

PLEISTOCENE - The glacial age or ice age thought to have begun from 1 to 2 million years ago and ended perhaps 10,000 years ago with the final retreat of the continental glaciers in North America and Europe.

POTABLE - Suitable or safe for drinking.

PRECIPITATE - To cause to separate from solution or suspension.

PREDATOR FISH - Species of fish which prey upon living organisms and other fish.

PYRITE - A common mineral composed of iron and sulphur (FeS_2) commonly called fools-gold.

QUIESCENT WATER - Calm water.

RECENT - Geologic time period following Pleistocene and extending up until the present.

RIPARIAN VEGETATION - Plants which grow along water courses.

RIPRAP - A layer of large rock fragments placed together to prevent erosion by water.

SALINE SOIL - A soil that contains soluble salts, usually chlorides and sulfates in high enough concentration so that the growth of most crop plants is reduced.

SCARP - A steplike ridge.

SEDIMENTARY - Descriptive term for rocks formed of sediments.

SEICHE - An oscillation of the elevation of a lake or inland sea that varies in period from a few minutes to several hours.

SEPTIC - Putrid.

SESSILE - Descriptive term for organisms found attached to a substrate.

SILURIAN - Period in geologic time thought to have begun about 360 million years ago and to have ended about 320 million years ago.

SPOIL - Earth and rock removed by dredging or excavation.

SUCCESSION - The natural, orderly, and predictable replacement sequence of plant and animal communities on a given site, which is reduced by changes in the environment associated with site occupancy by a particular vegetational community.

THALWEG - A line connecting the lowest or deepest points along a streambed or valley. The line of maximum depth.

THERMAL - Of, relating to, or caused by heat.

TILL - Nonsorted, nonstratified sediment carried or deposited by a glacier.

TURBIDITY - The condition of a body of water that contains suspended material such as clay or silt particles, dead organisms, or their parts, or small living plants and animals.

XEROPHYTIC - Low or deficient in available moisture for the support of life.

ZOOPLANKTON - Planktonic organisms belonging to the animal kingdom.

APPENDIX D

PROJECT ECONOMICS

(Revised Draft)

ECONOMIC DATA, EXTRACTED FROM U. S. ARMY CORPS OF ENGINEERS MAIN REPORT - BUFFALO METROPOLITAN AREA, NEW YORK WATER RESOURCES MANAGEMENT, INTERIM REPORT ON FEASIBILITY OF FLOOD MANAGEMENT IN CAZENOVIA CREEK WATERSHED. COMPLETE REPORT IS AVAILABLE AT U. S. ARMY ENGINEER DISTRICT, BUFFALO, NY.

D. COST EFFECTIVENESS OF CONSIDERED MEASURES

D.01 Table D-1 gives data on total costs and benefits, net benefits, and benefit/cost (B/C) ratios for flood control measures considered to warrant economic analysis. Note that out of a total of 16 considered measures, only 3 have B/C ratios greater than 1.0. Therefore, only these 3, floodproofing in Reach 3, a short levee in Reach 3, and an ice retention structure upstream of Reach 3, qualify for inclusion in a basinwide plan of action. Three such plans (Alternatives 1, 2 and 3 respectively) were developed by combining each of these economically viable measures with a basinwide floodplain management and flood insurance plan.

D.02 Detailed Costs for Alternative Plans

D.03 Table D-2 and D-3 give first costs and annual changes for Alternative 1, based upon October 1973 prices and on October 1972 level of development. Annual charges are amortized over a 100-year project life at an interest rate of 5-5/8 percent. Corresponding data for Alternatives 2 and 3 are given in Tables D-4 to D-7. Table D-8 summarizes economic data for the three alternatives.

D.04 Detailed Economic Update for the Recommended Plan

D.05 Alternative 3 was chosen as the recommended plan because it yields the highest net benefits and maximizes the B/C ratio. Upon completion of the selection process, a complete update of prices was undertaken. The costs given below refer to October 1974 prices based upon an October 1972 level of development.

D.06 First Costs

D.07 The detailed estimate of first costs for the recommended ice retaining structure is given in Table D-9. Allowances of 15 percent for lands and damages and 20 percent for all other items were used for contingencies.

D.08 Annual Costs

D.09 Annual costs for the selected plan are based on an interest rate of 5-7/8 percent and an amortization period of 100 years. Since the ice retaining structure could be constructed within one year, interest during construction has not been included. Annual charges for maintenance of the proposed improvements are based on annual installation and removal of the ice boom, occasional structural maintenance, and periodic removal of the sediment trapped behind the dam. The estimated annual costs are presented in Table D-10.

Table D-1

Cost Effectiveness of Considered Measures*

Measure	Reach	Total Average Annual Costs	Total Average Annual Benefits	New Average Annual Benefits	Benefit /Cost Ratio
Floodproofing	1	190,500	28,200(1)	- 162,300	0.15
	2	15,000	9,800(1)	- 5,200	0.65
	3	66,500	92,200(1)	- 25,700	1.39
	Tannery Brook	26,800	14,400(1)	- 12,400	0.54
Levees & Floodwalls	1	94,200	47,900	- 46,300	0.51
	2	42,100	12,300	- 29,800	0.29
(Alignment A)	3B	91,600	93,200	1,600	1.02
(Alignment B)	3	182,600	96,500	- 86,100	0.53
(Alignment C)	3	317,100	124,500	- 192,600	0.39
Reservoirs I	lower basin	1,748,900	341,400	-1,407,500	0.20
near Springbrook II	lower basin	1,628,000	341,400	-1,286,600	0.21
Diversion Channel	Tannery Brook	26,800	14,400	- 12,400	0.54
Ice Retention Structure	Protects Reaches 1, 2 & 3 to varying Degrees	68,600	141,300	72,700	2.06

*Updated to October 1973 price levels based upon October 1972 level of development.

(1) Average annual benefits are adjusted for items which are not prevented by floodproofing, including yard damage and costs of flood emergency operations and post-flood cleanup.

Table D-2

Estimated First Costs for Floodproofing for Reach 3

100-Year Protection

Item	Number	ESTIMATED FIRST COSTS		
		Federal	Non-Federal	Total
Residential Units (Basement flooding)	289	$208,100	$ 52,000	$ 260,100
Residential Units (First flood flooding)	62	297,600	74,400	372,000
Commercial Units	37	222,000	55,500	277,500
Public Units	0			
Supervision and Administrative Costs (10%)		72,800	18,200	91,000
Total First Cost		$800,500	$200,100	$1,000,600
Rounded First Cost		$801,000	$200,000	$1,001,000

Table D-3

Estimated Annual Costs for Floodproofing

Item	ESTIMATED ANNUAL COSTS		
	Federal	Non-Federal	Total
Rounded First Cost	$801,000	$200,000	$1,001,000
Annual Costs			
Interest and Amortization	45,200	11,300	56,500
Maintenance	500	9,500	10,000
Total Annual Cost	$ 45,700	$ 20,800	$ 66,500
Rounded Annual Cost	$ 46,000	$ 21,000	$ 67,000

Table D-4

Estimated First Costs for Levees and Floodwalls for Reach 3

100-Year Protection

Item	ESTIMATED FIRST COSTS		
	Federal	Non-Federal	Total
Lands and Damages		$166,800	$ 166,800
Relocations		33,200	33,200
Channel Improvements	$ 207,600		207,600
Levees & Walls	599,800		599,800
Internal Drainage	143,200		143,200
Total Cost (including Contingencies)	$ 950,600	$200,000(1)	$1,150,600(1)
Engineering & Design Supervision & Admin.	218,700	7,600(1)	226,300(1)
Total First Cost	$1,169,300	$207,600	$1,376,900
Rounded First Cost	$1,169,000	$208,000	$1,377,000

(1) Engineering and Design, Supervision and Administration Costs are not applied to lands and damages.

Table D-5

Estimated Annual Costs for Levees and Floodwalls

Item	ESTIMATED ANNUAL COSTS		
	Federal	Non-Federal	Total
Rounded First Cost	$1,169,000	$208,000	$1,377,000
Annual Costs			
Interest and Amortization	66,000	11,800	77,800
Maintenance	500	13,300	13,800
Total Annual Cost	$ 66,500	$ 25,100	$ 91,600
Rounded Annual Cost	$ 67,000	$ 25,000	$ 92,000

Table D-6

Estimated First Costs for Ice Retention Structure

West Seneca, NY

Item	ESTIMATED FIRST COSTS		
	Federal	Non-Federal	Total
Lands & Damages		$218,500	$ 218,500
Clearing & Dewatering	$107,700		107,700
Retaining Structure	414,100		414,100
Internal Drainage	7,200		7,200
Waterproofing Manholes	12,300		12,300
Aesthetic Treatment	33,800		33,800
Ice Boom	90,000		90,000
Total Cost (including Contingencies)	$665,100	$218,500(1)	$ 883,600(1)
Engineering & Design Supervision & Admin.	153,000		153,000
Total First Cost	$818,100	$218,500	$1,036,600
Rounded First Cost	$818,000	$219,000	$1,037,000

(1) Engineering and Design, Supervision and Administration costs are not applied to lands and damages.

Table D-7

Estimated Annual Costs for Ice Retention Structure

Item	ESTIMATED ANNUAL COSTS		
	Federal	Non-Federal	Total
Rounded First Cost	$818,000	$219,000	$1,037,000
Annual Costs			
Interest and Amortization	46,200	12,400	58,600
Maintenance	500	9,500	10,000
Total Annual Cost	$ 46,700	$ 21,900	$ 68,600
Rounded Annual Cost	$ 47,000	$ 22,000	$ 69,000

Table D-8

*Economic Data for Alternative Flood Control Plans

Plan of Action	Alternative 1 (1)	Alternative 2 (2)	Alternative 3 (3)
First Costs			
Federal	1,169,000	801,000	818,000
Non-Federal	208,000	200,000	219,000
Total	1,377,000	1,001,000	1,037,000
Annual Operation, Maintenance and Replacement Costs			
Federal	500	500	500
Non-Federal	13,300	9,500	9,500
Total	13,800	10,000	10,000
Average Annual Costs			
Federal	66,500	45,700	46,700
Non-Federal	25,100	20,800	21,900
Total	91,600	66,500	68,600
Total Average Annual Benefits	93,200	92,200	141,300
Net Average Annual Benefits	1,600	25,000	72,700
Benefit/Cost Ratio	1.02**	1.39	2.06

(1) Alternative 1: Levees in Reach 3B, Basinwide Floodplain Management and Flood Insurance

(2) Alternative 2: Floodproofing in Reach 3B, Basinwide Floodplain Management and Flood Insurance

(3) Alternative 3: Ice Retaining Structure Upstream of Reach 3, Basinwide Floodplain Management and Flood Insurance (Proposed Plan)

*Updated to October 1973 price levels based upon October 1972 level of development.

**Gives October 1974 prices and interest rate of 5-7/8 percent, this ratio becomes 0.98

Table D-9

Detailed Estimate of First Costs for the Recommended Ice Retaining Structure

Item	Quantity	Unit	Unit Cost(1)	Estimated First Cost(2) Federal	Non-Federal	Total
Land	95	Acre	$2,200.00		$209,000	$209,000
Clearing	15	Acre	750.00	$ 11,300		11,300
Beautification following Construction		L.S.		31,000		31,000
Dewatering and Access		L.S.		86,000		86,000
Excavation						
Common	10,600	C.Y.	1.87	19,800		19,800
Rock	1,050	C.Y.	15.50	16,300		16,300
Waterproof Manholes	29		450.00	13,000		13,000
Drainage Culvert and Control Gate		L.S.		7,500		7,500
Ice Boom		L.S.		81,400		81,400
Non-reinforced Concrete	4,900	C.Y.	65.60	321,000		321,000
Reinforced Concrete	125	C.Y.	163,00	20,400		20,400
Contingencies				121,500	31,400	152,900

Table D-9 (Cont'd)

Detailed Estimate of First Costs for the Recommended Ice Retaining Structure

Item	Quantity	Unit	Unit Cost(1)	Estimated First Cost(2)		
				Federal	Non-Federal	Total
Total Construction Cost				$729,200	$240,400	$ 969,600
Engineering and Design (13%)				94,800		94,800
Supervision and Administration (10%)				72,900		72,900
Total First Cost				$896,900	$240,400	$1,137,300
Rounded First Cost				$897,000	$240,000	$1,137,000

(1) October 1974 price levels

(2) Costs are rounded to the nearest one hundred dollars

Note: Contingencies are assumed to be 15 percent for lands and 20 percent for all other items

D.10 BENEFITS

D.11 Existing Flood Damages

D.12 The Corps of Engineers completed a damage survey for the January 1959 flood event during 1960. This survey covered Cazenovia Creek from the Buffalo River to Mill Road. A damage survey was also conducted after the March 1972 flood in the West Willowdale Drive area and the Southgate Plaza area in Subreaches 3B and 3C. An inventory of all structures in the floodplain from Ridge Road upstream to Mill Road was made in April 1972. During September and October 1972, a similar inventory was made covering the reach from the Buffalo River to Ridge Road. The various structures were classified into residential, commercial, and public and other categories; and first-floor elevations were established for all structures and streets in the various reaches. This inventory also determined the number of existing structures in each category which would be affected by the 100-year discharge under ice-affected conditions. The number of structures that would experience first-floor flooding under these conditions was also recorded.

D.13 Flood losses or damages in the floodplain along Cazenovia Creek were designated by classes and types of damages. Tangible damages were considered to be physical damage caused by inundation, flood emergency losses or costs incurred in fighting or preparing for flooding, and business or other financial losses resulting from decreased production, loss of profit and wages, and increased cost of normal operations and living. Damages were determined for three categories: residential, commercial, and public and other. Nonrecurring flood damages, such as the destruction of a building that is not replaced, were not included in the flood damage compilation.

D.14 The lower basin was divided into three flood damage reaches, each of which was subdivided further into subreaches (see Table 32 and Plate 2). The Tannery Brook floodplain was also divided into reaches as shown on Plate 24. These reaches have been established by geographic and land-use features whenever possible to facilitate economic analyses of separable areas subject to flooding.

D.15 Flood damages for the reaches and subreaches in the lower Cazenovia Creek Basin were evaluated for the 1972 level of development. Plate 27 presents the stage-damage curves for each Cazenovia Creek subreach based on January 1973 price levels. The price levels were updated to October 1974 for the detailed economic analysis of the selected plan. Stage-damage curves for Tannery Brook are shown on Plate 28. The average annual damages presented in Table C-11 were determined for each reach using the stage-frequency curves on Plates 21 and 25 and the stage-damage curves presented on Plates 27 and 28.

Table D-10

Annual Costs for the Recommended Ice Retention Structure

Item	Annual Costs (1)		
	Federal	Non-Federal	Total
Rounded First Cost	$897,000	$240,000	$1,137,000
Annual Charges			
Interest (5-7/8%) and Amortization (100-year economic life)	52,900	14,100	67,000
Maintenance	900	10,500	11,400
Total Annual Costs	$ 53,800	$ 24,600	$ 78,400
Rounded Annual Costs	$ 54,000	$ 25,000	$ 78,000

(1)October 1974 price levels

D.16 The anticipated increase in flood damages due to future growth was not considered to be significant based on the land use master plan presented in Plate 18 and on expected floodplain management regulations. Reach 1 is already extensively developed in the area near the Buffalo River, while Cazenovia Park will continue to remain undeveloped. In Reach 2, residential and commercial development does exist, but future encroachment into undeveloped floodplain areas could be controlled by floodplain management regulations. Reach 3 is developed except for the tract of land between Parkside Drive and Ridge Road. Development of this tract should be regulated to prevent floodway construction and construction of floodprone improvements in the flood fringe area. Upstream of Mill Road, beyond the ice retaining structure, the creek generally flows in a gorge and significant flood damagable developments neither exists nor are probable with proper floodplain management. The areas along Tannery Brook are extensively developed, but future developments should be required to be floodproofed.

D.17 Benefit Analysis

D.18 The primary effect of the ice retaining structure on flood conditions is to reduce ice-affected stages. The monetary benefits derived as a result of the stage reduction is the difference between average annual damages under existing ice-affected flow conditions and the average annual damages to be expected with free flow conditions. Flood damages for existing conditions are shown in Table D-11. The average annual damages under free flow conditions in Table D-12 were determined using the stage-frequency curves on Plate 21 for free flow

Table D-11

Existing Average Annual Flood Damages

Damage Area	Average Annual Damages(1)
Subreach 1A	$ 72,100(2)
Subreach 1B	10,400
Subreach 2A	13,400
Subreach 2B	1,800
Subreach 3A	100
Subreach 3B	104,300
Subreach 3C	10,100
Tannery Brook	16,500
Total	$228,700

(1) October 1974 price levels; for development existing in mid-1972.

(2) This amount includes the amount allocated annually by the City of Buffalo for the use of amphibious vehicles.

Table D-12

Remaining Average Annual Damages After
Construction of the Ice Retaining Structure

Damage Area	Average Annual Damages(1)
Subreach 1A	$54,800(2)
Subreach 1B	1,400
Subreach 2A	400
Subreach 2B	1,700
Subreach 3A	100
Subreach 3B	100
Subreach 3C	300
Tannery Brook	16,500
Total	$75,300

(1) October 1974 price levels; for development existing in mid-1972.

(2) Damage reduction from discontinuance of ice patrols.

conditions and the stage-damage curve presented on Plate 27. The total average annual benefits due to flood damage reduction ($153,400) is equal to the existing average annual flood damages in Table D-11 less the remaining average annual damages in Table D-12.

D.19 In addition to benefits attributable to existing development, benefits due to economic growth must also be considered. The economic growth factor is used to estimate future flood damages to existing development due to economic growth. Per capita income of residents in the Cazenovia Creek floodplain will increase during the 100-year economic life of the project. Part of this per capita income increase will be used to make improvements to existing structures and contents. Future damages must, therefore, be adjusted to account for the added value of these improvements during the project life.

D.20 The factor used to incorporate future economic growth has been based on the projected growth, over the project life, of constant dollar per capita income as published by OBERS*. OBERS' baseline projections provide the most reliable set of data available for the evaluation of economic impact of development programs and projects. These baseline projections are available only on a decadal basis from 1980 to 2020, however, and are not available for a 100-year period. Projections are not normally developed beyond a 50-year period because uncertainties make such projections unreliable. The growth factor based on OBERS' 50 years of projected and historical data was considered to be the best estimate of economic growth for the considered project life. Per capita income was projected to increase from $3,531 in 1969 to $13,700 in 2020.

D.21 Only part of the $11,040 per capita income increase would be related to real property expenditures since the increase is also consumed in the form of food, recreation, transportation, medical care, and other services. The distribution of personal consumption expenditures (PCE) has been used to determine the percentage of per capita income spent on real property. The percentage distribution of PCE was obtained from the Statistical Abstract of the United States. PCE on real property has historically been about forty percent of the total. Therefore, only forty percent of the per capita income increases was assumed to be spent for improvements to existing floodplain properties and thus results in the increases in future flood damages. Forty percent of the per capita increase has been multiplied by the 5-7/8 percent compounded growth factor, 0.24**, for the 50-year period for which per capita income was projected. The compounded growth factor was used since a graphical representation of the projected per capita income values most closely represented a compounded growth curve. The resulting value from the calculation, $1,060, was divided by $3,433 to determine

*Obers Projections. Volume 2, BEA Economic Areas. U. S. Water Resources Council, Washington, DC

**The compound growth factor .24 discounts future values to present worth.

the percent increase. The 31-percent increase, multiplied by the existing average annual benefits, represents the increase in average annual benefits due to future economic growth to existing development. Although the economic growth factor results in an increase in the B/C ratio over the project life, it was not used during the plan selection process.

D.22 In addition to benefits from the reduction in flood damages to existing developments as discussed earlier, other less quantifiable benefits can be attributed to construction of the ice retaining structure. These would include: possible land enhancement to undeveloped areas in Subreaches 2B and 3A as a result of reduction in maximum flood stages, increased opportunities for parkland development, a more aesthetically pleasing flood management measure than floodwalls or levees, and possible reduction in downstream sedimentation problems.

D.23 Economic Justification

D.24 A summary of the results of the economic analysis for the selected plan for flood protection for Cazenovia Creek and Tannery Brook is shown in Table D-13. The recommended ice retaining structure would result in total annual benefits of $153,400 at an average annual cost of $78,400 giving a benefit/cost ratio of 1.96 without consideration of future economic growth and other factors discussed above.

D.25 Cost Apportionment

D.26 Apportionment of cost for the recommended ice retaining structure between Federal and non-Federal interests is based on existing Federal legislation and administrative policies governing flood control. In this regard, all costs associated with construction of levees, floodwalls, interior drainage structures, bank protection, and aesthetic treatment are assigned to the Federal Government. Local interests would provide all lands, easements, and rights-of-way; pay all grade change damages; and make necessary relocations and/or modifications of utilities. Operation and maintenance costs are shared, with the Federal Government assuming responsibility for sediment removal on the basis that sediment trapped by the ice retention structure would eventually have been dredged from the Buffalo harbor at Federal expense.

D.27 The distribution of first costs, including appropriate engineering design, supervision, and administration costs, is shown in Table D-14. The estimated annual charges, based on a 5-7/8 percent interest rate and a 100-year project life, are shown in Table D-15.

Table D-13

Summary of Benefit/Cost Analysis of the Selected Plan[1]

	$
Rounded annual benefits	153,400
Rounded annual costs	78,400
Net annual benefits	75,000
Benefit/cost ratio	1.96
Remaining annual damages (exclusive of Reach 1A and Tannery Brook)	4,000
Remaining annual damages in subreach 1A	54,800
Remaining annual damages in Tannery Brook	16,500
Total remaining annual damages in Cazenovia Creek Basin	75,300

(1) Based on October 1974 price levels and mid-summer 1972 level of development; includes allowance for discontinuance of ice breaking activities by the City of Buffalo.

Table D-14

Apportionment of Project Costs

Item	Federal	Non-Federal	Total
Lands		$209,000	$ 209,000
Clearing	$ 11,300		11,300
Dewatering and Access	86,000		86,000
Ice Retention Structure	397,700		397,700
Ice Boom	81,400		81,400
Beautification Following Construction	31,000		31,000
Contingencies, Engineering Supervision and Admin-	289,200	31,400	320,600
Total	$896,600	$240,400	$1,137,000
Rounded Total	$897,000	$240,000	$1,137,000

Table D-15

Annual Charges

Item	Federal	Non-Federal	Total
First Costs	$897,000	$240,000	$1,137,000
Interest and Amortization	52,900	14,100	67,000
Maintenance	900	10,500	11,400
Total Annual Charges	$ 53,800	$ 24,600	$ 78,400
ROUNDED CHARGES	$ 54,000	$ 26,000	$ 79,000

APPENDIX E

BIBLIOGRAPHY

Beardslee, C. S. and H. D. Mitchell. Birds of the Niagara Frontier Region. Buffalo: Bulletin of the Buffalo Society of National Sciences, 1965

Blackmon, P.D., Glacial Geology of the East Aurora, New York, Quadrangle Unpublished M. A. Thesis, University of Buffalo, 1956

Buehler, E. J. and I. H. Tesmer, Geology of Erie County, New York, Buffalo Society of Natural Sciences, Bulletin Vol. 21, No. 3, 1963

Broughton, J. G., Fisher, D. W. Isachesen, Y.W., and L. V. Rickard, Geologic Map of New York, 1961. New York Museum and Science Service, Geol. Survey, Map and Chart Series, No. 5

Calkin, P. E., Strand Lines and Chronology of the Glacial Great Lakes in Northwestern New York. Ohio J. Sci., Vol. 70, No. 2, 1969

Coker, R. E. Streams, Lakes, Ponds. Chapel Hill: University of North Carolina Press, 1954

Conant, R. A Field Guide to Reptiles and Amphibians. Boston: Houghton Mifflin, 1958

Hamilton, W. J. The Mammals of Eastern United States. Ithaca: Comstock Publishing Co., Inc. 1943

La Sala, A. M., Ground-Water Resources of the Erie-Niagara Basin, New York. State of New York Water Resources Commission, Basin Planning Report ENB-3, 1968

Mackenthun, D. M. The Practice of Water Pollution Biology. USDI Federal Water Pollution Control Administration, Division of Technical Support, 1969

Odum, E. P. Fundamentals of Ecology. Philadelphia: W. B. Saunders Company, 1971

Reck, C. W., and E. T. Simmons, Water Resources of the Buffalo-Niagara Falls Region, U. S. Geol. Survey Circ. 1973, 1952

Reid, G. K. Ecology of Inland Waters and Estuaries. New York: Reinhold Publishing Company, 1964

Ruttner, F. Trans. D. G. Grey and P. E. J. Frey. Fundamentals of Limnology. Toronto: University of Toronto Press, 1963

Symecko, R. E., Glacial Geology of the Orchard Park New York Quadrangle Unpublished M. A. Thesis, University of Buffalo, 1967

REPORTS

City of Buffalo, New York Department of Public Works, prepared by DeLeuw, Cather and Company of New York, Inc.: Flood and Erosion Control Report Cazenovia Creek, Buffalo, NY, 1974

Department of the Army, Buffalo District Corps of Engineers. Prepared by Acres American Incorporated: Cazenovia Creek Flood Control Study Phase 2, Part 1 Report, 1974

Department of the Army, Buffalo District Corps of Engineers: Phase I First Interim Report on Cazenovia Creek New York for Flood Control, Allied Purposes, Restoration, and Wastewater Management, 1973

Erie and Niagara Counties Regional Planning Board: Atlas of Regional Plans and Programs, 1974

(Same agency) Parks, Recreation, and Open Space Study, 1969

(Same agency) Regional Population Projections, 1972

(Same agency) Water Quality Management Study, 1973

Erie-Niagara Basin Regional Water Resources Planning Board, New York State Department of Environmental Conservation, Division of Water Resources: Erie-Niagara Basin: Comprehensive Water Resources Plan, 1969

(Same agency) Fish and Wildlife Studies, Erie-Niagara Basin, Phase I

(Same agency) Fish and Wildlife Report, Erie-Niagara Basin, 1968

Department of Agricultural Economics, New York State College of Agriculture, Cornell University: 1964 Census of Agriculture, Erie County, 1967

U. S. Department of Agriculture, Soil Conservation Service and Department of Agronomy, Cornell University: Soil Survey Interpretations of Soils in New York State, 1972

Wildlife Management Institute: Transactions of the 28th North American Wildlife and Natural Resources Conference, 1963

U. S. Department of the Interior, Bureau of the Census: 1970 Census

U. S. Senate, The Effect of Channelization on the Environment, Hearing before the Subcommittee on Flood Control -- Rivers and Harbors -- of the Committee of Public Works. Serial No. 92.H24. Washington, D. C.: Government Printing Office, 1971

STATEMENT OF FINDINGS

Buffalo Metropolitan Area, NY
Water Resources Management
Interim Report on Feasibility of
Flood Management in Cazenovia Creek Watershed

I have reviewed and evaluated, in light of the total public interest, the reports of other studies, and other documents compiling data concerning the proposed action in the Cazenovia Creek watershed, Erie County, NY. Similarly, I have also reviewed and evaluated the views of other agencies and the public, relative to various plans of improvement. I have studied and analyzed the possible consequences of these plans, considering engineering feasibility, environmental effects, economic feasibility and social well-being. I have also considered means of eliminating or minimizing possible adverse environmental, social, and economic effects, in accordance with Section 122, P.L. 91-611.

Background

The purpose of this study was to identify flood management needs in the Cazenovia Creek Watershed and to develop alternative plans to provide for them. The study was undertaken in response to a resolution of the Committee on Public Works of the House of Representatives adopted 13 June 1956; resolution of the Committee on Public Works of the United States Senate, adopted 10 July 1961; and resolution of the House Committee on Public Works adopted on 14 June 1972.

Flooding is the paramount water-related problem in the Cazenovia Creek watershed. Damaging flooding along Cazenovia Creek generally occurs during late winter and early spring when major runoff events from snowmelt and rainfall on frozen ground frequently combine with ice jamming. Local flooding, particularly in the lower developed portion of the basin, is often aggravated by ice jams that cause higher than normal stages. Discharges that would be non-damaging under ice-free conditions have resulted in severe flood damages when ice jams temporarily dam them. Flooding has occurred in February and March 1904, January 1929, June 1937, March 1942, March 1955, March 1956, January 1959, January 1962, March 1964, February 1965, December 1969, January 1970, and March 1972. The maximum discharge on record, 13,500 cfs, occurred during the flood of March 1955. Both tangible and intangible damages and losses are experienced during flooding along Cazenovia Creek. Tangible damages and/or losses include: physical damage to flooded structures, utilities and transportation facilities; flood-fighting costs; cleanup costs; business losses; and, increased operating and living costs during a flood. Intangible losses include the social, psychological and health problems that are associated with flooding.

During the study, coordination was maintained with various Federal, State, and local agencies and Governmental entities, including the U. S. Department of Housing and Urban Development, the National Park Service, the U. S. Fish and Wildlife Service, the U. S. Environmental Protection Agency, the U. S. Soil Conservation Service, the Erie and Niagara Counties Regional Planning Board, the NYS Department of Environmental Conservation, the City of Buffalo, the Town of West Seneca, the Village of East Aurora, the Town of Elma and the Town of Aurora. Inputs to the study from the general public were obtained through public meetings and numerous discussions with individuals and organizations in the area. Formal public meetings were held on 11 December 1973, 21 June 1974 and 26 November 1974. Meetings with individuals and local interest groups were held on 22 August, 28 August, and 13 September 1974, and on 8 March 1974. A workshop was held on 7 December 1973.

Selected Plan

The proposed plan provides for construction of an ice retention structure in the Town of West Seneca, NY floodplain. The purpose of the ice retention structure is to retain ice formed in the headwaters of Cazenovia Creek. The primary effect of retaining ice formed in the headwaters would be to reduce ice jamming and attendant flooding downstream from the ice retention structure. The structure would include a short-height reinforced concrete dam, a stilling pool and a floating boom. The dam, comprising a two-stage weir, would extend across the Cazenovia Creek floodplain at a site approximately 2,000 feet upstream of Mill Road. It would be about 900 feet long and its low stage weir would extend 250 feet from the high south bank of the creek channel, across the channel, and into the present floodplain. The dam would include three drain conduits to permit draining the stilling pool for that period of the year that the ice retention function is not needed. Normally, the stilling pool would lie nearly totally within the existing creek channel and would have a maximum depth of approximately 10 feet and a surface area of about 11 acres. The high-stage weir would extend from the low-stage weir the remaining distance across the floodplain to the north side of the valley. This part of the dam would stand approximately eight feet above the surface of the floodplain near the creek. A floating boom would extend from an anchor on the left (south) abutment across the mouth of the low-stage weir (the principal spillway) to an anchor on the dam. Floodplain management and participation in the National Flood Insurance Program are recommended throughout the entire Cazenovia Creek Watershed.

Alternatives

Thirteen other alternatives were considered:

No Action - This alternative means that no Corps action would be taken to solve flooding problems in the Cazenovia Creek Basin. Therefore, damages and losses due to flooding would continue to occur at present rates.

Local Protection in Reach 3 and Floodplain Management - This alternative provides for a levee-floodwall measure. Based on October 1973 prices and an amortization interest rate of 5-5/8 percent, this plan was found to be barely viable economically with a benefit/cost ratio of 1.02. However, based on October 1974 prices and a then prevailing interest rate of 5-7/8 percent, this alternative is no longer viable with a benefit/cost ratio of 0.98. With higher present prices and an interest rate of 6-7/8 percent, this alternative cannot be economically justified.

Floodproofing in Reach 3 and Floodplain Management - This alternative requires floodproofing in Subreach 3B and would entail modifying existing buildings to reduce flood damages. Floodplain management would also be a part of this plan. This alternative does not completely satisfy the project objectives since it would not address the disruption and inconvenience caused by flooding (e.g. disruption of traffic and public services). Further, this alternative offers a lower benefit/cost ratio than the proposed plan (1.39 versus 2.06) and lower net benefits ($25,700 versus $72,700).

Diversion Channel Tannery Brook - This alternative provides for diversion of floodwaters from Tannery Brook to a tributary of Buffalo Creek. It was rejected as economically unjustifiable with a benefit/cost ratio of 0.47.

Flood Retention Reservoir Site 1 - This alternative provides for construction of a reservoir on Cazenovia Creek approximately two miles upstream of Springbrook, NY. It was rejected as economically unjustifiable with a benefit/cost ratio of 0.20.

Flood Retention Reservoir Site 2 - This alternative provides for construction of a reservoir on Cazenovia Creek approximately one mile upstream of Springbrook, NY. It was rejected as economically unjustifiable with a benefit/cost ratio of 0.21.

Levee and Floodwall Reach 1 - This alternative provides for construction of levee and floodwall measures in Reach 1. It was rejected as economically unjustifiable with a benefit/cost ratio of 0.51.

Levee and Floodwall Reach 2 - This alternative provides for construction of levee and floodwall measures in Reach 2. The alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.29.

Levee and Floodwall Reach 3, Alignment B - This alternative provides for a levee to extend from high ground near Seneca Street, southward along the west side of Parkside Drive to the north bank of the creek's channel, then eastward along this bank to high ground at the Southgate Shopping Plaza. From the upstream end of the levee, a three foot high sheet pile

floodwall would extend to Union Road. Upstream of Union Road a levee would be constructed along the right bank to a point upstream of Mill Road, and then across the floodplain to meet high ground near Seneca Street. Riprap bank protection would be provided as required along this section. The creek channel along West Willowdale Drive near Parkside Drive would be relocated and its bank protected with riprap. The alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.53.

Levee and Floodwall Reach 3, Alignment C - This alternative provides for a levee-floodwall measure to enclose the entire right side floodplain from just upstream of the Mill Road Bridge to the Ridge Road Bridge. The measure would be similar to the Alignment B measure from Parkside Drive upstream. Downstream from Parkside Drive, the levee would extend along the right bank of the creek channel to high ground adjacent to the Ridge Road Bridge. This alignment would encroach into the floodway to decrease the flow area significantly. The decrease would be compensated for by enlarging the channel between the Ridge Road and Union Road Bridges. The alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.39.

Floodproofing Reach 1 - This alternative provides for modification of buildings in Reach 1 to reduce flood damages. The alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.15.

Floodproofing Reach 2 - This alternative provides for modification of buildings in Reach 2 to reduce flood damages. However, the alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.65.

Floodproofing Along Tannery Brook - This alternative provides for modifications of buildings in the floodplain along Tannery Brook. However, the alternative was rejected as economically unjustifiable with a benefit/cost ratio of 0.54.

Evaluation

In evaluating the selected plan, the following points were considered pertinent:

Environmental Considerations

Construction of the ice-retention structure would necessitate removal of existing vegetation from the proposed dam location and five acre stilling pool site. Even though Cazenovia Creek is generally shallow and much of the creek bottom is bedrock, some disruption to aquatic life and potential fish spawning areas would be unavoidable. The impact on existing aesthetic features of the environmental setting due to the project would be mitigated

to some degree by grading and planting disturbed soil areas. In addition, the Contractor would be required to abide by contract specifications for protection of the environment as outlined in "Civil Works Construction Guide Specifications for Environment Protection," CE 1300, dated June 1973.

Social Well-Being Considerations

Protection provided by implementation of the proposed project would improve the social well-being of community residents in Reaches 1 through 3 by reducing the potential threat of flooding. The frequency and duration of overbank flooding would decrease and flood protection would be provided for approximately 697 residences and 64 businesses. Alleviation of flooding frequency would reduce the threat to traffic and emergency services, physical injury and property damage and public health and safety.

Engineering Considerations

The ice retention structure provides protection of various degrees for all properties in the floodplain downstream. It provides protection in the major damage area against the 125-year frequency flood. Engineering considerations dealt with the function of the considered structure and practicability of its construction. In development of the proposed plan, consideration was given to alternative features for improvement. The plan is considered to reflect properly the minimum scope of improvement needed to obtain the desired degree of protection.

Economic Considerations

Economic considerations resulted in selecting a plan that would economically reduce flood damages to residential, public and commercial developments in the Cazenovia Creek watershed. Based on 1974 prices, the estimated total first cost of the selected plan is $1,137,000. Total average annual benefit would be $153,400 and total average annual cost would be $78,400. Accordingly, the benefit/cost ratio of the selected plan is approximately 2.0/1.0.

Conclusion

I find that the action proposed is based on thorough analysis and evaluation of various practicable alternative courses of action for achieving the stated objectives. Wherever adverse effects are found to be involved, they cannot be avoided by following reasonable alternative courses of action which would achieve the purposes specified by the Congress. Where the proposed action has an adverse effect, this effect is either ameliorated or substantially outweighed by other considerations of national policy. In

light of these findings, I am convinced that the action as proposed is fully consistent with national policy, laws, and administrative directives. Accordingly, it is my decision that the total public interest would best be served by the implementation of the recommendation.

Date: 25 March 1975

BERNARD C. HUGHES
Colonel, Corps of Engineers
District Engineer

I concur with the preceding Statement of findings.

26 April 1975
(Date)

W. O. BACHUS
Brigadier General, USA
Division Engineer

I concur with the preceding Statement of findings

17 July 1975
Date

DRAKE WILSON
Brigadier General, USA
Deputy Director of Civil Works